April 16, 1923

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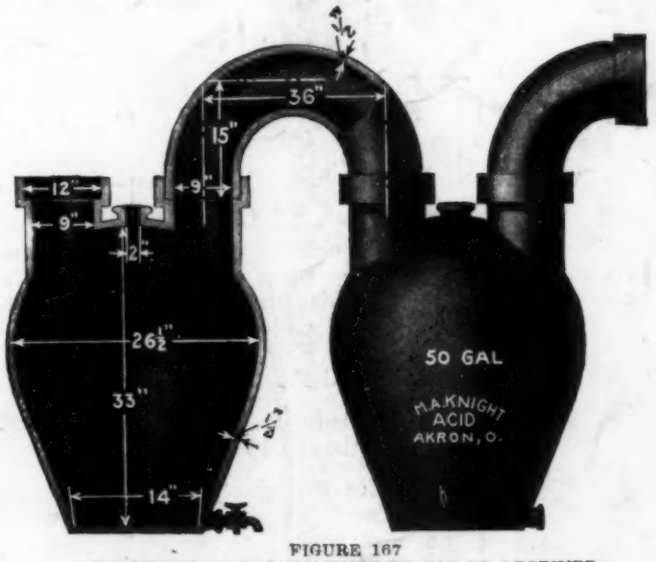

FIGURE 167
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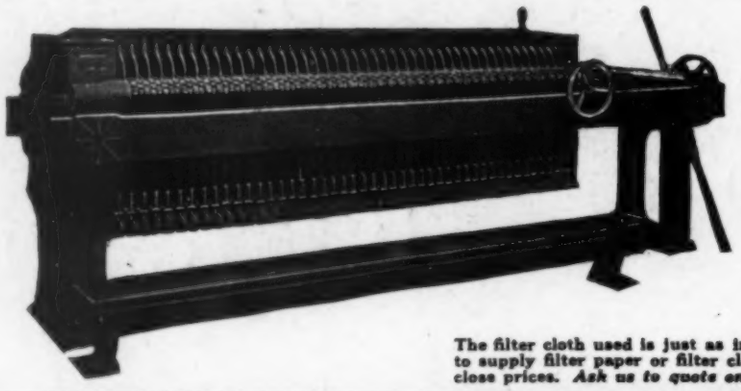

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H. C. PARMELEE, Editor

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Highlights of The A.C.S. Meeting

ALTHOUGH perhaps a shade more academic than usual, the meeting at New Haven was nevertheless one of the most significant in the history of the American Chemical Society. Circumstances made it so. The presence of a distinguished group of world leaders in science and the university ceremonies attending the dedication of Yale's new chemical laboratory gave an international academic interest to the occasion. And, too, Dr. EDGAR F. SMITH'S historical address had a quality of scholarship and of the art of presentation which left its deep impression on all who heard it.

From the viewpoint of the society, however, the extended sessions of the Council and its studious reception of the important reports of the committee on society procedure marked real milestones of progress in the direction of a more unified and harmonious membership. A few knotty problems are still unsolved, but the Council, as well as the committee, demonstrated that it is awake to the society's shortcomings. Further progress rests largely with the sections. The discussion at the first Council meeting brought out clearly the fact that the committee's report had been carefully studied by certain of the sections and that some of the representatives had been given definite instructions on which they were able to base their actions as the different issues were decided. On the other hand, it was equally evident that a good share of the membership as such had had no opportunity to consider the matter or to instruct their councilors. Although the committee was discharged and graciously voted the thanks it so well deserved, the fact remains that progress in society procedure is not a dead issue. Both the majority and minority reports, together with the Council's discussion and action, are worthy subjects for further study by the sections and the membership at large.

The division programs, even though long, were not uninteresting, and they actively competed for the attention of the members and guests. The symposiums on catalysis and colloids and the important general papers by Prof. T. G. DONNAN and Dr. OSKAR BAUDISCH reflect the intense interest of American chemists in the fundamentals of their science. But that practice also vied with theory was indicated by the close attention given to the special programs on motor fuels, insecticides and fungicides and the materials of equipment construction. In the sessions of the Organic Division, which not so very long ago were rather slimly attended, there was at times standing room only, and not much of that. Industrial chemistry, on the other hand, lured into its conferences many men of pure science. This is as it should be, because industrial research has assumed its proper rank in the great procession of science, it marches with the Very Learned, and except among some of the laggards, it has ceased to be the Recipe Mill uninformed persons think it should be.

Next September the society will meet in Milwaukee and conditions there will likely favor a shading toward industrial rather than academic interests. Thus will come the balance that makes it possible for the society to steer an even course of progress.

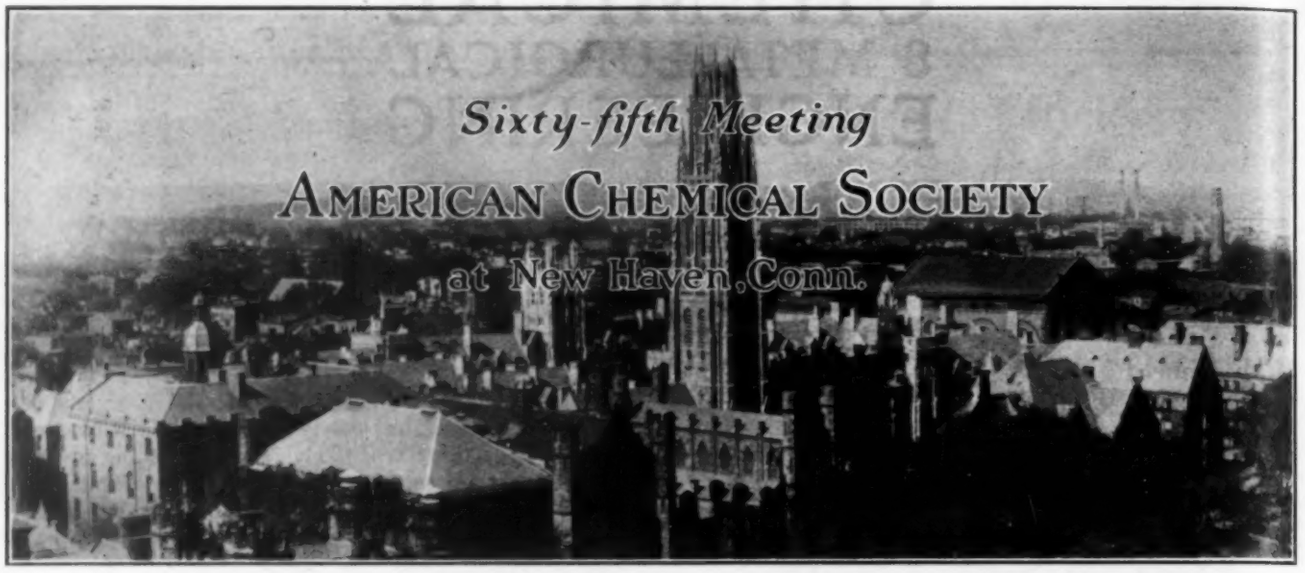
Materials for Equipment Construction

A SYMPOSIUM is not unlike a dangerous drug from a journalistic point of view. It is splendid if used occasionally as a stimulant perhaps, but too frequent use brings immunity to stimulation. Then the drug loses its force. So in *Chem. & Met.* we have been careful to use the symposium in moderation and each time for a definite, constructive purpose.

In this issue we publish a series of notes and essays on Materials for Equipment Construction. To chemical engineers there is no question so ubiquitous, so puzzling or so imperative as "What material shall we use in this equipment?" Everyone can recall a process which failed or succeeded because of the clumsy or deft selection of materials. Yet with all its importance there is a surprising tendency in this problem to copy the practice of others without knowing whether this practice has brought success or failure or without being fully acquainted with conditions under which the material was used.

Periodically, therefore, we must wake up and devote an increased amount of intelligent attention to this phase of our work. We should ask questions such as, What is the latest practice in making pressure vessels? What new materials are there which will resist acid corrosion? or weathering? or high temperature? What have they been doing in the alloy field or with industrial glassware?

This symposium does not pretend to be complete. It is a stimulant and not a dictionary. By no means are all the materials of construction mentioned, nor is there any attempt to be exhaustive in the treatment of any of them. In most of the essays the modern practice or the modern tendencies in the use of a material or a group of materials are reflected. Sometimes a producer offers a word of advice to consumers. Sometimes a consumer reports his success or failure. The net result is, first, a picture of the most important activities in the materials of construction field and second, a reminder of a neglected opportunity on your part if you are not utilizing the best knowledge that is available in selecting your materials for equipment fabrication. Finally, it is a promise on our part to keep this problem before you, for we believe it lies at the foundation of production success.



Impressive Circumstances Connected With the Dedication of Yale's New Chemical Laboratory Feature Spring Gathering—Reports of General Sessions and Important Council, Division and Section Meetings

EDITORIAL STAFF REPORT

HISTORY records that on two other occasions the American Chemical Society met at New Haven. But never was a meeting held under such impressive circumstances nor before such a distinguished group as gathered for the sixty-fifth meeting during the week of April 2, 1923. In round numbers 1,500 members and guests were present—including such world leaders in science as Sir J. J. Thomson, Professors F. G. Donnan of London, A. F. Holleman of Amsterdam, Giuseppi Bruni of Milan, G. Urbain of the Sorbonne and Principal Irvine of St. Andrew's. The dedication of the Sterling Memorial Laboratory marked an event in the history not only of Yale University but of chemistry in America.

Council Meetings

From the point of view of the society a great deal of interest attaches to the two important Council meetings held in Byers Hall on Monday and Wednesday afternoons. President E. C. Franklin presided at both. About 115 councilors were present at the first meeting and 60 to 75 at the second.

Prof. O. B. Tower of Western Reserve University presented a memorial note on the long and active life of the late Prof. Edward W. Morley, concluding with appropriate resolutions of appreciation, which were adopted by a rising vote.

The secretary was instructed to turn over the society's collection of autographed letters from eminent men to Prof. Edgar Fahs Smith, in whose keeping they will be properly cared for and eventually made available to all chemists, along with the rest of his great store of historical papers.

A new section was chartered with headquarters at Erie, Pa., and the secretary was instructed to provide a charter for another section which shall include Rock Island, Davenport, Clinton and Moline, as soon as proper application has been made.

Dr. A. M. Comey, formerly of Wilmington, Del., but now of Cambridge, Mass., was elected to succeed Dr. George D. Rosengarten, whose term as member of the committee on national policy has expired.

COMMITTEE REPORTS HEARD

A large number of committees handed in reports, of which the following were a few: The advisory committee to the War Department recommended the proper and authoritative study of color for uniforms, to provide for minimum visibility. The committee on employment recommended the addition of $2,400 to the budget to provide for employment information in the news edition of *Industrial and Engineering Chemistry*. The committee on industrial alcohol recommended an advisory committee, preferably of technical men, to look after the sales of industrial alcohol. It is believed that this will help rather than hinder the enforcement of prohibition, inasmuch as the present non-technical force with its police powers is more easily deceived than would be a group of informed men, whose business is to look after industrial sales. It should also help to diminish the confusion and disorder which now reigns in regard to the industrial uses of alcohol.

The secretary reported that 1,278 members of the society were dropped for delinquency in payment of dues on Jan. 1, 1922.

A little flurry of excitement followed a resolution in regard to the action of the advisory committee in connection with an amended Stanley bill in which the advisory committee, acting for the Council, expressed itself as favoring a provision in the patent law that would require foreign patentees or owners of patents under certain conditions either to produce or to license productions in this country. After a rather heated discussion on the propriety of the committee's action, its decision was supported. It brought out, however, a good story from Henry Howard of how German industrialists working with their government succeeded in making a treaty with the United States which would

not require them to make patented dyes in this country nor establish here the technique of making dyes. The story involved a most remarkable series of false scents and misleading trails, all carefully planned out beforehand.

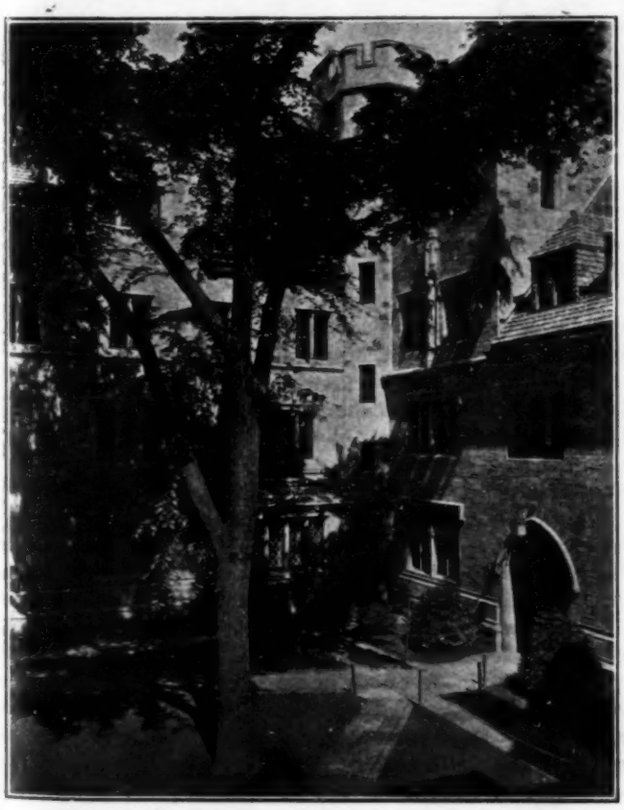
The difficult work began with the majority and minority reports of the committee on progress in society procedure. At first it appeared that the problems were too big and too far-reaching to be decided by the Council at that late hour, and finally it was resolved to refer the majority and minority reports to the advisory committee with the request that they be digested and recommendations offered to the Council at the September meeting.

The session adjourned about 6 o'clock.

Society Policies

At a subsequent meeting of the advisory committee it was decided that the report had not received sufficient discussion by the Council and accordingly a special session was arranged for on Wednesday afternoon. At that time over 4 hours was devoted to a consideration of this important report on society policies and procedure. The committee, consisting of A. V. H. Morey, chairman; George L. Coyle, L. C. Drefahl, Graham Edgar, H. C. Parmelee, R. E. Swain and J. N. Swan, had given more than a year's study to basic problems connected with the management and policies of the American Chemical Society. A unanimous report, together with majority and minority discussion of society membership, publications and finances, was read by the chairman and considered by the Council while functioning as a committee of the whole. Later, the following significant action was taken on the committee's recommendations:

A general plan of regional representation of directors



NATHAN HALE ENTRY, HARKNESS MEMORIAL
The J. Willard Gibbs entry is also in this court

was approved and a committee authorized to report the necessary changes to be made in the constitution and bylaws.

By unanimous vote, an executive committee to consist of the president and secretary of the society, the editor of the *Journal of the American Chemical Society* and the editor of *Industrial and Engineering Chemistry*, the last past president and three councilors at large was authorized to replace the present advisory committee. Its powers were further extended to include those usually held by an executive committee.

Although it was generally agreed that the Council was too large to be an efficient governing body, none of the schemes proposed for reducing its membership could gain the meeting's approval, and the matter was laid on the table for later action.

Intersectional meetings of the American Chemical Society will probably be approved and extended as soon as a working plan is formulated by a committee to report at the next meeting of the Council.

After a discussion of the election of members and classified membership, the Council adopted the committee's recommendation that a special committee be appointed to study and report its findings in the matter of definite measures for enhancing the value placed on membership in the society.

The very intimately related subjects of the society's publications and its finances come in for a major share of the Council's discussion, especially since on certain matters there was a division of opinion within the committee. The Council appeared to be unanimous in its opinion that the financial condition of the society is fundamentally sound and no material economies are likely to be effected in the society's present management. The majority and minority reports pointed out that the society's advertising business was conducted on a satisfactory and reasonable basis, and in answer to a question from the floor, the editor of the *Industrial Journal* declared that an increase in the advertising rates in that publication was already under contemplation. Certain other technical considerations in connection with the production of the society's publications were also discussed, but without definite action by the Council.

A significant motion passed during the last few minutes of the meeting instructed the secretary to mail the final program to members 10 days in advance of the Council meeting. It also set the final date of acceptance of papers at least one month before the general meeting.

Chemistry and the Public

The purpose of the meeting in New Haven, in the words of Prof. Treat B. Johnson, chairman of the executive and program committee, was to bring together chemistry and the public. The fact that Woolsey Hall was crowded to capacity for the first general session was pleasing evidence of the society's success in this direction. In his introductory remarks Professor Johnson called attention to the fact that this was the third time the American Chemical Society has met in New Haven. The first meeting was in 1899, when the society's membership was 1,570; at the time of the second meeting, in 1909, the membership had increased to 4,136.

The society was then officially welcomed to New Haven by state, city and university, represented respectively by Lieutenant-Governor Hiram Bingham, Mayor David E. FitzGerald and President James R. Angell. Presi-

dent E. C. Franklin responded briefly for those assembled and expressed thanks for the cordial reception that had been accorded the society. He then introduced Francis P. Garvan, president of the Chemical Foundation, who delivered the principal address of the meeting.

The occupation of the Ruhr, Mr. Garvan declared, makes conditions exactly parallel to those obtaining in 1915 as far as our foreign supply of chemicals is concerned. However, thanks to the American chemists, the condition as to the domestic supply is entirely different. We are now able to supply 98 per cent of the chemicals used in the textile and other consuming industries, and these industries are now operated at maximum capacity without in any way feeling the necessity for imported chemicals. According to Mr. Garvan, one of the sincerest compliments to American chemistry is to be seen in the fact that salvarsan, said to be smuggled in from Germany, is being marketed under the name "arsephenamine," the official term coined by American chemists to describe the product manufactured in the United States.

General Scientific Meeting

Fundamentals in industrial chemistry might well have been the title, for it certainly was the theme, of the Tuesday afternoon general scientific meeting. The speakers, each in his particular field, went right down to basic principles, each determining the present status and future progress in his line. Thus food, petroleum, bread, artificial silk and other subjects in turn received a very thorough analysis.

Carl L. Alsberg, one of the directors of the Food Research Institute of California, gave briefly a résumé of the basic problem which chemists must consider in the food industry. Passing by as of less importance the chemistry of food production, food-manufacturing processes, fertilization for food increase and waste elimination, in his own terms he risked being called a "speculator." In doing so he brought out strikingly the fundamental energy requirement of food production, if one considers this a chemical problem of synthesis. Admittedly, the chemist can synthesize carbohydrates and fats without insuperable difficulty even on a large scale. And proteins would doubtless give more trouble, but the products into which they are hydrolized before use in the body probably can well be made by chemical means either as food for man or feeding stuff for animals.

Petroleum Problems

"The History and Status of Chemistry in Petroleum Research" was discussed by C. O. Johns, research director of the Standard Oil Co. of New Jersey. This speaker presented a most interesting review of some of the early chemical investigations on petroleum, giving particular attention to the very remarkable study of petroleum made by Benjamin Silliman, Jr., in 1855. At that time this investigator disclosed the properties of the crude material and its various fractions, cited the possibilities of thermal cracking, used various methods for purification, and suggested the possibilities for manufacture of lubricants, gas making, paraffine production and candle manufacture, which are striking examples of his clear vision of the possibilities of this industry.

In closing his address he made a strong plea for as careful consideration of petroleum research as of coal-tar research, pointing out that the latter field of investigation, though relating to a much smaller industry at present, has gone far beyond petroleum in its scientific development.

Cellulose Silk

W. O. Mitscherling, discussing cellulose silk, considered first the several processes for manufacture that are used at the present time. Special attention was given to the technical methods used for purification and for spinning in connection with the different processes. It was pointed out by the author that in 1922 approximately twenty-three million pounds of cellulose silk was produced, a quantity approximately 3 per cent more than natural silk. It is emphasized, however, that cellulose silk will never altogether replace the natural product, though it may continue in the future to gain in importance because of the many applications to which it is particularly adapted, having, in the opinion of this speaker "a splendid market of its own."

Another address of fundamental significance was that of Dr. Oskar Baudisch, special research fellow at Yale. A brief review of his important paper will be included in a subsequent issue of *Chem. & Met.*

Dedicatory Exercises

The dedication of the Sterling Laboratory took place in the Industrial Chemistry Laboratory, in which a platform was built for the president, faculty and special guests, all of whom wore cap and gown. George H. Church, chairman of the trustees of the Sterling fund, gave a short sketch of the life of John W. Sterling, told of his constant and splendid integrity, of his devotion to Yale, of how he induced Mrs. Osborn to donate the Osborn Hall and the Osborn Biological Laboratory to the university, and that it was their purpose, by means of the Sterling fund, to provide the Sterling Hall of Medicine and a new library in addition to what has already been done. This consists in the endowment of ten professorships, and the building and equipment of the Sterling Laboratory. Mr. Church then formally gave the keys of the building to President Angell.

Dr. Angell began by a record of the men to whom Yale is indebted for the development of chemistry. They were met on the 119th anniversary of the first lecture of Benjamin Silliman, who taught diligently for 49 years until in 1855 he became professor emeritus and was succeeded by his son, Benjamin Silliman, Jr. He noted as their pupils John C. Norton, who taught argricultural chemistry; George F. Barker, of the University of Pennsylvania, and Oliver Hubbard, of Dartmouth. Then there was Samuel T. Johnson, professor of agricultural chemistry, who established the Connecticut Experiment Station in 1877, the first of the kind in this country. There followed Chittenden and Jenkins and Osborne. Josiah Willard Gibbs became professor of mathematical physics in 1871, and served for 32 years.

President Angell concluded by telling of the nomadic existence that chemistry led at Yale, being housed during its early days in the cellar of the president's house. And now they had these imposing halls!

President E. C. Franklin followed with a few words of acknowledgment and then Dr. Edgar Fahs Smith made an address on "The History of Chemistry in America, With Special Reference to Yale." This was a rare treat. Dr. Smith was in his best form, which alone would mark the occasion as historical. In substance he said that we should have to go back to 1608 to find the beginning of chemical industry in the United States, for in 1607 Jamestown, Va., was founded, and in the

following year bold spirits erected a glass house in the woods and exported their product to England. They made beads also for trading purposes, and some of the beads they made exist today. By 1619 two or three blast furnaces had been blown in. Later the glass house and these furnaces were destroyed in an Indian massacre.

John Winthrop the younger was among the first members of the Royal Society and he was in frequent correspondence with his scientific friends in London. He made many contributions to the proceedings of the Royal Society. The notion of alchemy, of the transmutation of metals, still prevailed, and Winthrop had a sense of it. Indeed it lasted well into the eighteenth century. There was the Rev. Ezra Stiles, the seventh president of Yale, who was the first to teach chemistry at the college, and he surely would not acknowledge any addiction to this form of witchcraft or wizardry; for the practice of alchemy was considered no less than this. But the Rev. Ezra Stiles, who discussed the secular ways of matter by day, would experiment in secret at night, and who shall say how tempted he was or how far he resisted the temptation to consider the ways of Satan in the transmutation of base metals into gold? Stiles was a correspondent of Priestley, and that also would bespeak his favor with Dr. Smith, for Dr. Smith has a very tender spot in his heart for the memory of that rather cantankerous and obstinate old gentleman.

Then followed a short historical note of the life of Benjamin Silliman the elder, who, after graduating from Yale and studying law, accepted the call of his alma mater to teach chemistry.

Silliman began teaching chemistry at Yale in 1804 and for 15 years he worked 15 or 20 ft. underground in the cellar of the house of the president of the college. In 1805 he made a trip to Europe and met Sir Humphry Davy and others. In 1818 he established the *American Journal of Science*. His correspondence with Hare also shows him to have been an active producer, although his great work was teaching. "Those who smooth the road to science," said Dr. Smith, "are often more useful than the men of original research." Among the men inspired by his teaching were Dana the geologist, Brush, Brewer the geographer, Johnson of the Agricultural College, and J. Willard Gibbs, the first of physical chemists.

It was not alone what Dr. Smith said but also his manner of saying it that gave his address such rare distinction. Its literary beauty was a subject of frequent discussion throughout the meeting among those that heard it. In fact we shall probably have to wait for several generations before we shall have another great chemist with the finish, the wit and the subtle elegance of speech to match the ex-provost of Pennsy.

The Chemist in Industry

The sessions of the Industrial Section, which were held in the large lecture room of the Osborn Memorial Laboratory, enjoyed an attendance which varied between 30 and 300; there being, usually, between 50 and 75 members and visitors in attendance throughout the session. It is perhaps unfair to pick out only three outstanding features, for the general standard of articles was excellent and the discussions, for the most part, were intelligent and animated. There were three papers, however, of greater interest than the rest, possibly because of timeliness or some other unusual circumstance.

The first was a paper by L. V. Redman, entitled "Phenol Resins in Chemical and Allied Industries." It was not so much the utility of the phenol resins in chemical engineering industries that was novel or significant. As a matter of fact, the consumption of these is relatively insignificant.

STERLING LABORATORY, SHOWING SAWTOOTH CONSTRUCTION

Analyzing the distribution of these products, by industries, it was found that in 1917 the automobile industry took 65 per cent of the total production; that smoking articles took 20 per cent, and miscellaneous industries, mainly telephones, 15 per cent. In 1921, 50 per cent was used by the automobile industry; 15 per cent in the smokers' products; 15 per cent still in the miscellaneous, and 20 per cent in what might be termed mechanical products—buttons, pencil holders, handles, etc. In 1922, due to the remarkable development of radio, 34 per cent of the total business was radio; 30 per cent automobiles; 6 per cent smokers' articles; 10 per cent miscellaneous, and 20 per cent mechanical. The radio business is peculiar in that it utilizes a very large percentage during the months from January to April.

The industry has been on an insecure basis because of raw materials. Phenol has always been a foreign product. During the war a tremendous phenol capacity was created in the United States, but this rapidly dwindled until there is comparatively little produced at present. In order to make the industry more secure, the Bakelite Corporation is building a large phenol plant on the shores of Lake Erie, which will be in operation within a year. This will make the industry

a nationally contained industry, as is the case with one of the other great plastics, celluloid, which of the four great plastics is the only self-contained American industry; the others, rubber and fiber, are still dependent on foreign resources.

Progress in the Study of Corrosion

The second significant paper had to do with corrosion. It was presented by Professor Whitman, of Massachusetts Institute of Technology. Reviewing the work done in that field, Professor Whitman pointed out that the most important factors in corrosion were, actually, the removal of the hydrogen produced by the action of the hydrogen on iron. This removal can take place in two ways. The first method is by supplying oxygen to form water—and this is a straight diffusion problem. In other words, the rate of removal of hydrogen depends directly on the rate at which oxygen can get to the surface of the metal to remove the hydrogen atoms. Second, it can be removed by the evolution of hydrogen gas, as occurs in acid solutions. The experimental work of this problem consisted in suspending a steel shaft with a smooth surface in acids of varying concentrations, and rotating it at various speeds. The acid concentration was varied from less than 0.05*N* to 5*N* and the shaft was speeded up from zero to 4,000 r.p.m. Corrosion was measured by titrating the iron in the solution at the end of a given time. At rest, it was found that the corrosion in strong acids was much greater than that in weaker acids, but when rotation started it was found that the rate of corrosion diminished for a time and then increased rapidly, all concentrations approaching the same corrosion rate, so that at 4,000 r.p.m. there is practically no difference in the rate of corrosion in weak and strong acids. This shows pretty conclusively that there are two effects: one which depends on the hydrogen-ion concentration and the other which depends on the rate of diffusion of oxygen to the steel surface.

Experiments were then tried with oxygen, nitrogen and air as the atmosphere over the liquid, with increasing rate of revolution. It was found that the corrosion under oxygen was about 3½ times that under air, whereas that under air was considerably greater than that under nitrogen. This seems to show again, conclusively, that the oxygen diffusion is a primary factor at high speed.

The Plauson Mill Cornered at Last

The third high spot in the session was a discussion of the colloid mill, by W. J. Kelly, of the Goodyear Tire & Rubber Co., who has been in Germany and has watched the mill in operation. It was, for most of the audience, the first time that any accurate, first-hand data were presented on the colloid mill, and it was therefore exceedingly interesting. Mr. Kelly described clearly the design of the mill, it being a set of staggered teeth on a rotating drum, the teeth rotating between baffles on the side of the mill and the clearance being about 1 mm. The rotation does actually reach 12,000 r.p.m. and for those high speeds is direct connected with motor or turbine. It also is run with a belt when the speed is as low as 3,000 r.p.m.

In answering questions with regard to the mill, Mr. Kelly pointed out that it was a batch mill and that the present size handles, roughly, 5 kg. of material, 1 kg. being the material to be ground and 4 kg. being water. It takes about 10 minutes to grind up this batch to a size of material which is almost colloidal. An appreciable percentage of the particles have a vigorous Brownian movement and go down to less than 1μ in diameter. The turbine-driven mill is almost vibrationless; the bearings are thoroughly protected and the packing is a compound of graphite and asbestos. Power consumption is extremely large, being, roughly, 28 hp. As yet it can hardly be called a commercial success—in fact, the commercial application is extremely limited. At the present time it cannot be applied to large-scale work, although there does not seem to be any reason why the difficulties cannot be overcome.

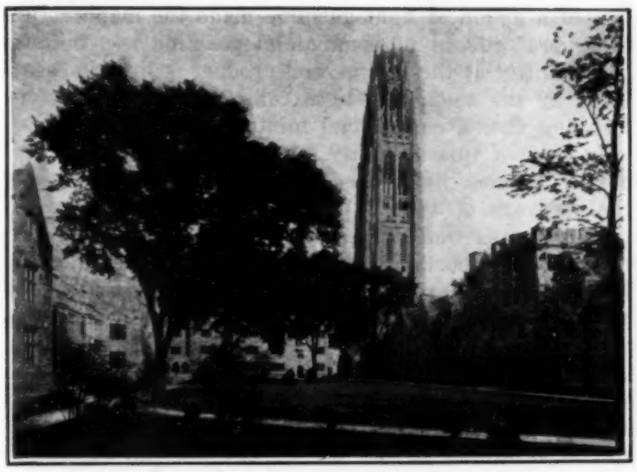
Mr. Kelly said, in answer to some criticisms of the Newport Company for not wanting to sell the mill in the American market, that the company had received its first mill last August and did not want to sell the mill until sure that it was reliable and until the limits of applicability were exactly known.

Considerable animated discussion occurred with regard to the mill, and it was altogether an ideal paper for a meeting. It developed out of a comprehensive survey of the industrial colloid field by Dr. Harry N. Holmes, of Oberlin University. Dr. Holmes discussed the colloid mill and then went on to other fields of colloid activity—silica gel, lignin, syneresis, smoke settling, lubrication, carbon and lamp black, glass and enamel, paper and paint. He urged the establishment of fellowships for the study of colloidal problems and believes that widespread application would follow from fundamental studies.

Some Materials of Construction Papers

At the first session Professor Boltwood, of Yale, described the Sterling Laboratory and some of the problems that had to be solved during its design. Prof. C. R. Hoover, of Wesleyan University, then discussed an elaborate series of experiments on laboratory table tops and reached the conclusion that, without counting the psychology of the situation—which often should be the determining factor—Alberene was the most suitable material for laboratory table tops. C. M. Strickland, of the American Rolling Mills Co., presented a paper on the resistivity of iron and its application to chemical industry. The importance of small amounts of impurities which reflect directly in the industrial corrosion bill was one of the significant things mentioned. It

LIBRARY IN STERLING LABORATORY



HARKNESS MEMORIAL QUADRANGLE

was stated that in 1921 pig-iron production was less than the rust loss to industry, this being probably due to the relatively large amount of impure iron produced during the preceding years of war activity.

The symposium on materials of construction in chemical industries was continued with a paper by Prof. C. S. Robinson of M.I.T. on the use of wood, pointing out the necessity of selecting the material with considerable care, as wood was not a standard material by any means, and further that wood from the same tree varied considerably, depending on the grain and the selection of the piece. In other words, two pieces of maple might vary more appreciably than maple and pine. In general, however, there seems to be an appreciable tendency toward the use of cypress and pine in the East and the redwood in the West. This paper was discussed ably by W. A. Peters, of the du Pont company, who reflected the experience of his company in regard to the action of various kinds of material on wood. W. Evans, of the B. F. Goodrich Co., gave an interesting discussion of the growth of the rubber industry, and, finally, of the use of all kinds of rubber, with the exception of hard rubber, in chemical engineering industries.

Hard Rubber an Increasing Factor

Mr. Buttfield, of the American Hard Rubber Co., then described some of the uses of hard rubber in industrial work, hard rubber being described as material containing between 15 and 50 per cent sulphur and varying considerably, depending upon the time of the cure as well as the mix. There is no limit to what might be called "hard rubber," however. One interesting recent development was the use of hard rubber for coating and lining metal objects, modern practice favoring the use of a soft rubber binder which sticks to the metal surfaces better.

In the beginning of the Friday session Dr. Charles H. Herty gave a talk on the trials and tribulations of the organic chemical industry during the past year, and he sounded a note of optimism for the future. Dr. Turrentine, of the Bureau of Soils, presented a paper on the extraction of nitrates from caliche, pointing out that poor chemical engineering was largely responsible for the inefficiency of the Chilean industry and that, in general, a recovery of 55 per cent was made on the caliche. The export tax, of course, represents about 41 per cent of the total cost, labor 19 per cent and fuel 11 per cent. Efficiencies in plant operation would naturally cut down the total cost per pound and even though the ratios might not be changed appreciably, the cost would be considerably improved. As a matter of fact, the investors are using all the surplus to pay dividends and there is therefore no surplus for developments. Dr. C. L. Reese commented on the report, stating that in some quarters greater efficiency was achieved by chemical control, although absolute chemical control was impossible because of the difficulty of sampling crude caliche.

Division of Organic Chemistry

The first morning was taken up with a symposium on catalysis. As there were twelve papers in all, there was scant time for proper presentation and less for discussion.

The effect of small quantities of iron in aiding the reduction of aldehydes in the presence of platinum black was strikingly presented by Roger Adams.

J. S. Reichert and J. A. Niewland described the catalytic combination of benzene homologs with acetylene to derivatives of diphenyl ethane.

H. S. Taylor brought out the fact in his talk on negative catalysis that one molecule of diphenylamine in 10,000 mols of benzaldehyde absolutely inhibits the oxidation of the aldehyde by oxygen.

There were almost as many varieties of theories as there were papers, and the indications were that the development of theories which will be capable of general acceptance is still far off. This subject of catalysis seems to deserve an individual section so that proper discussion would be possible without further encroaching on the time of the Organic or the Physical section, whose rosters are already overcrowded.

In the general program the papers by the foreign visitors excited considerable interest and were given with the lecture hall filled to capacity.

A. F. Holleman of the University of Amsterdam, Holland, presented a rather general paper reviewing the reactivity of various groups in the benzene derivatives, with particular reference to the effect of a substituent in determining the position taken in the molecule by groups entering later.

Many Interesting Papers

One paper of interest was that by James F. Norris and E. O. Cummings on "The Electrolytic Reduction of Various Organic Acids." The remarkable feature was brought out that fumaric acid in the form of its sodium salt could be almost quantitatively reduced to succinic acid without the use of a diaphragm, whereas with maleic acid a diaphragm was absolutely necessary to obtain suitable yields.

Thomas Midgley, Jr., together with C. A. Hochwalt and G. Calingaert, described the preparation of diplumbic hexaethide, a byproduct of their researches on anti-knock materials. This compound has not been previously prepared.

The chemical compounds present in coal tar were discussed by J. M. Weiss and C. R. Downs, who presented the picture of the compounds really present in appreciable amounts in American coke-oven tar, together with the proportionate amounts found. Phenanthrene was shown to be next to naphthalene the most abundant material present and, contrary to popular conception, only about thirty compounds are present in sufficient amount to be of even potential commercial importance.

A novel field of research was that of Elmer E. Brown

and Treat B. Johnson, who have collected large quantities of tubercle bacilli and subjected them to chemical analysis. The results presented were preliminary and the work is to be continued further.

Another paper, by J. J. Donleavy and T. B. Johnson, proposed the crystalline compounds formed by organic acids with pseudo thio-ureas as a means of identification. Various of these salts were exhibited and showed a fine crystalline appearance.

A rather novel feature for the organic section was the use of moving pictures to demonstrate various types of laboratory apparatus by H. T. Clarke of the Eastman Kodak laboratories.

Apart from the papers already mentioned, there was a very large number of other worthy contributions, the unfortunate part being that the number of papers on the program was so great that adequate time could not be given to either presentation or discussion.

Motor Fuel Symposium

The members of the Division of Petroleum Chemistry joined with the Section of Gas and Fuel Chemistry on Friday morning for a Motor Fuel Symposium under the chairmanship of Dr. Van H. Manning, director of research of the American Petroleum Institute. The purpose of this symposium was to bring out the important fundamentals of present-day knowledge of motor fuel supplies and requirements from a chemical point of view. The program consisted of five papers taking up five distinct phases of the subject.

Availability, usability and power-producing ability were three phases of fuel requirements discussed by S. W. Sparrow of the Bureau of Standards, who presented the first paper. In determining usability the explosive range, distillation range, latent heat of evaporation, flash point, freezing point, separation point, viscosity, detonation characteristics, spontaneous ignition temperature and corrosiveness were discussed. Great emphasis was laid upon the necessity of having a uniform viscosity of the fuel.

Available Petroleum Supplies

F. W. Lane and A. D. Bauer were the authors of a paper, "Economic Aspects of Motor Fuel Supply From Petroleum." They pointed out the steadily increasing percentage of the petroleum produced in the form of gasoline because of increasing temperature of cut and increasing cracking of lighter fractions into gasoline constituents. They believe that increases in production will be accomplished to a considerable extent by further recovery from abandoned wells, by improved working methods in old fields and by greater care in conserving the lighter fraction of oils after removal from the well. The greatest benefit for our future years will, however, come from more efficient utilization in the engine itself. It is to this possibility which these authors point with the greatest optimism.

Refinery Problems in Motor Fuel Supply

Frank A. Howard and N. E. Loomis of the Standard Oil Co. of New Jersey presented a discussion of important refinery problems bearing upon adequacy of motor fuel supply. Proper plant equipment, including countercurrent cooling methods, ample condensing equipment, comprehensive gas-tight vapor-recovery system and other modern plant facilities, were urged as the most important plant requirements. It was pointed out that loss of a gallon of light gasoline made the manufacture of several gallons of commercial gasoline less because the quantity of the commercial product is limited essentially by the amount of light constituents available for blending into a commercial mixture.

In view of this necessity for maintaining proper proportion among light, medium and heavy constituents the recovery of volatile liquid hydrocarbons from the refinery gases was suggested by the authors as second only to the importance of proper processing equipment. Of course, such recovery system requires particularly great care in having gas-tight vapor lines throughout the plant. And to supplement the equipment and the vapor recovery the authors pointed out that it is absolutely essential to protect storage tanks against evaporation losses. This phase of the subject was discussed with special reference to the use of Sealite, the compound recently described before the American Petroleum Institute. This patented compound is a mixture of glucose, cornstarch, glue, calcium chloride and other constituents in a liquid form that can be beaten up into a froth which is spread on the surface of the oil tanks. A layer approximately 1 in. thick is recommended by these speakers, as this quantity is found to be effective over a period of at least a year. With it the evaporation losses are only one-fifth that occurring in ordinary tank storage.

New Motor Fuels

Henry A. Gardner of the Institute of Industrial Research, Washington, reported briefly on work which he has been doing for the Bureau of Aëronautics of the U. S. Navy Department. The use of anhydrous alcohol, which is now available commercially, is particularly advantageous with aviation fuels. It is free from gum-forming constituents or corrosive agents and seems to have "anti-knock" characteristics, especially when used in mixtures of 30 per cent alcohol with 70 per cent gasoline. With such mixture extended tests by the navy are under way from which it is hoped that very complete information will be available as to performance under conditions of flight. Such fuel has one disadvantage in that it takes up moisture from the air when exposed to damp atmospheres, causing separation of the constituents under some circumstances. But with properly closed containers this difficulty can, in the opinion of the author, be avoided.

Wilbert J. Huff of the Koppers Co. discussed coal tar as a source of fuel for internal combustion engines, giving particular attention to the possibility of using naphthalene or oils which require different methods of burning in an engine than are used with gasoline. The author reviewed the history of the use of naphthalene in such engines and pointed out some of the limitations and some of the possible advantages which might be realized from this as a motor fuel.

Gas and Fuel Chemistry

In order to encourage coke-oven operators connected with steel plants to release the tar for refining instead of burning it, effort has been made by the Koppers Co. to develop methods for burning the soft pitches formed by partial distillation of coke-oven tars. One of the important problems involved is the design of equipment for pumping and burning these heavy tars or soft pitches which remain after the light oil constituents have been removed. Wilbert J. Huff discussed the fundamental data which he has obtained for the design of tar-handling equipment, particularly the relation of tem-

perature to viscosity of tars and soft pitches derived from them.

E. R. Weaver and P. G. Ledig of the Bureau of Standards described a simple device for determining the approximate concentration of water vapor in a gas. The operation of the device depends upon the change of conductivity of a thin film of hygroscopic material with changing moisture content of the atmosphere. The results reported indicate that a few parts per million of water vapor is sufficent to produce a definite indication on the device and that up to a partial pressure of 20 or 30 mm. the indications are significant and reliable.

The Burrell gas indicator for combustible gases in air was discussed by L. H. Milligan, who reported on changes in this device and tests he has made with it in the course of his work at the Bureau of Mines.

Heat Balances and Heat of Carbonization of Coal

A brief report was made by D. W. Wilson and L. Evans of the Buffalo Station of the Massachusetts Institute of Technology regarding the fundamental principles which should be observed in striking a heat balance on industrial equipment. The authors bring out clearly the error frequently made in this sort of engineering calculation through failure to realize the necessary precautions for consistency of computation. Particular emphasis is laid upon difference in apparent efficiency or apparent loss that may result from different bases of calculation as to temperature of reference. Changing the reference temperature often changes by many per cent the apparent heating loss or the apparent efficiency of a system.

The thermal behavior of coal during carbonization has been studied experimentally in the laboratory at the U. S. Bureau of Mines, Pittsburgh station. J. D. Davis reported on this work. It is shown by this author that the heat of reaction depends very much upon the maximum temperature to which the carbonization of the coal is carried. Over the lower range of carbonization temperatures coals usually show endothermic reactions; but between 400 and 700 deg. C. the net heat of reaction is exothermic; whereas at still higher temperatures the overall effect is given as endothermic. In every case, however, the results show only a small heat of reaction for coals, usually less than 20 calories per gram on the curves presented.

Division of Petroleum Chemistry

A varied program including several papers of unusual importance attracted a record number of petroleum chemists to the sessions of this division. In the absence of Dr. T. G. Delbridge, who had been forced to resign from the chairmanship because of new responsibilities in the Atlantic Refining Co., and of Vice-Chairman R. R. Mathews, Dr. W. F. Farragher, of Mellon Institute, presided. Eleven papers were read and discussed at the first session of the division, which then joined with the Section of Gas and Fuel Chemistry for the joint symposium on motor fuel.

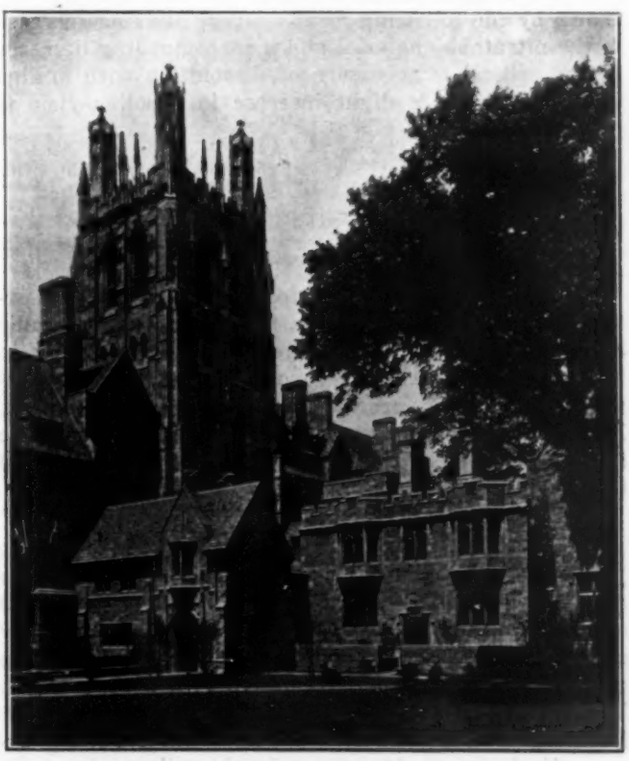
Higher Alcohols From Petroleum Olefines

The production by the Standard Oil Co. of New Jersey of higher alcohols from petroleum olefines was described by W. W. Clough and Carl O. Johns, of the research division, development department, of that company. Dr. Johns, who presented the paper, pointed out that although the olefines were absent from crude petroleum, they were produced in considerable quantities during pressure still cracking. By reaction with concentrated sulphuric acid, alkyl esters are formed which are hydrolyzed with water to yield the alcohols. This is the basis of the present process which has been placed on a successful commercial basis, largely through the efforts of M. D. Mann, Jr., who is in charge of the company's alcohol plant.

It is significant that in all of these alcohols the hydroxyl group is on the second carbon atom of the straight chain molecule. No branch chains or OH groups in other than secondary positions have been observed. Of the various alcohols, isopropyl (2 - propanol) is perhaps the best known. It is a clear, colorless liquid, not definitely toxic but capable of producing peculiar physiological effects entirely different from those produced by ethyl alcohol. Its chloride is an excellent fat solvent. The secondary butyl alcohol (2 - butanol) was formerly only a laboratory curiosity, prepared by an expensive organic synthesis. However, it is now prepared in lots of thousands of gallons by distillation from the crude mixtures of higher alcohols. It forms at 87.5 deg. C., a constant boiling solution containing 72.7 per cent of alcohol by weight. The acetate is prepared by refluxing with acetic anhydride. The secondary amyl (2 - pentanol) forms a constant boiling solution at 119.1 deg.

The chlorides of all three alcohols are interesting organic compounds, and the fact that their use is not as dangerous as ether or benzol implies that they may become useful solvents for fat extraction.

The paper by Prof. C. W. Botkin of New Mexico A. & M. College was presented in abstract by C. L. Jones of Mellon Institute. The preliminary experiments described indicate that by pressure decomposition the yield of crude gasoline from shale oils may be increased to 45 per cent and that this treatment greatly improves refining qualities. The yield and quality of the crude motor fuel fraction, however, is not so high as obtained from the usual petroleum oils under the same conditions.



A CORNER OF THE HARKNESS MEMORIAL

The continued interest in viscosimetry and its importance to the petroleum industry was evidenced in three significant papers on this subject. Dr. W. H. Herschel of the Bureau of Standards discussed tests in which the actual temperature in the outlet tube of a viscosimeter of the Saybolt type was determined with a thermocouple in order to procure evidence in regard to proper bath temperatures. Prof. E. C. Bingham and G. R. Hood of Lafayette College and W. H. Fulweiler of the United Gas Improvement Co. reported on changes in the viscosity of mineral oils on standing. The question had been raised whether mineral oils maintain a constant fluidity suitable for use in calibrating viscosimeters. A sample of pale mineral oil measured by W. L. Hyden in 1921 and showing a validity of 0.9243 was redetermined recently with the same instrument under exactly the same conditions and an increase in fluidity of 1.36 per cent was obtained.

Dr. Fulweiler reported in his paper that a white medicinal oil examined by him had at first decreased in viscosity and then after a year started increasing. In the case of another oil that was being used in interlaboratory standardization of the Saybolt instrument an increase in viscosity of 0.9 per cent was noted within a few months. Another mineral oil showed a fair constancy for over a year. Lard oil, on the other hand, started decreasing and then suddenly increased to 17 per cent—obviously showing it to be unsatisfactory as a standard.

Contact Catalysts for Cracking

Contact catalysis in the vapor phase cracking of petroleum hydrocarbons was the subject of two papers presented by Thomas Midgley, Jr., of the General Motors Research Corporation and Prof. James R. Withrow of Ohio State University. In the first it was pointed out that selenium, the basis of powerful anti-knock materials, is also a contact catalyst for cracking oils when it is used in the form of ferrous selenide. As shown by the following results a very striking increase in the nitratable material and a corresponding decrease in the critical temperature of dissolution with aniline were obtained. A slight increase in gasoline yield is to be noted:

	Original Kerosene	With Pumice	With Fe_2O_3	With FeSe
H_2SO_4 Absorption (per cent)	4	20	22	28
Crit. temp. of dissol. with aniline (deg. C.)	60.5	53	55	46
Nitratable content (per cent)	23	17	18	43
Gasoline content (per cent)	0	25	30	40

The work reported by Professor Withrow was to extend Midgley's investigations to include other metallic oxides in order to see if there was any periodicity in the cracking effect. So far none has been noted. Elementary selenium proved the most effective catalyst. None of the other compounds was higher than metallic iron, whereas nickel and the sulphides of the iron group tend to decrease cracking.

Coloring Matter of Cracked Gasoline

Dr. B. T. Brooks and H. O. Parker of the Mathieson Alkali Works in a joint discussion of the coloring matter of cracked gasoline pointed out that the bright yellow color that sometimes comes from high-temperature cracking is probably due to conjugated di-olefine bodies. The authors proved that sulphur compounds were not the cause of this color by cracking a water-white pharmaceutical oil and obtaining a bright yellow-colored oil. This color was effectively removed by fullers earth. Midgley later pointed out that silica gel would accomplish the same purpose.

The last paper to be presented was that of the division's secretary, Dr. W. A. Gruse, and was of significance in that it suggested a direct means for the evaluation of motor fuels. The distillation test is not as reliable an index of the value of a fuel for the internal combustion motor as is the point of initial condensation (dew point). Accordingly an apparatus has been developed for the direct determination of this significant physical constant. The dew points determined in this apparatus were uniformly higher than those calculated by the method based on the 85 per cent point in the distillation tests.

Cellulose Division

The outstanding feature of the sessions of the Cellulose Division was the joint meeting with the Sugar Division at which J. C. Irvine, principal of St. Andrew's University (Scotland), spoke on "The Chemistry of the Polysaccharides." Professor Irvine's talk was a marvel for the way in which it made such a complex subject as the chemistry of the polysaccharides appear so very simple. Were it not for the glimpses of the extraordinarily painstaking technique required, one would have obtained the impression that this was one of the simplest fields of experimental chemistry. Professor Irvine expressed the opinion that the constitution of cellulose may be expressed in terms of molecular structure, but he pointed out that this did not tell us the mode of polymerization nor could it explain how these molecules are marshaled to give the cellulose fiber or the starch grain. In other words, while it would give us the constitution of the cellulose molecule, it would not in any way settle the chemistry of cellulose, which is almost entirely in the realm of the colloidal state.

Next in interest was the symposium on "Oxycellulose, Cellulose Hydrate and Hydrocellulose," which was the special order of business for Thursday afternoon. The symposium was opened by Professors L. E. Wise and Harold Hibbert and was participated in by a considerable number of those present. It was agreed that the term "hydrocellulose" was particularly unfortunate and that it would be advantageous if some means could be taken for abolishing it.

Dr. Alfred Tingle, of the E. B. Eddy Co., called attention to some products derived from sulphite waste liquor which have physical properties which render them easy to work with. He suggested their possible importance as starting materials for a new series of derivatives.

As a result of their further study of the chemistry of wood cellulose, Sherrard and Froehlke and also Sherrard and Gauger expressed the opinion that the cellulose of the woods which they have examined is not the same fundamentally as the cellulose from cotton.

According to Dr. L. F. Hawley of the Forest Products Laboratory it is not possible to obtain the methoxyl in wood charcoal in the form of methanol by distillation. Various catalysts were tried and also distillation with various gases. The same author, with L. C. Fleck, reported that there was in all woods examined a relation between the toxic effect of the water extract of the wood, when allowed to act on wood-destroying fungus, and the durability of the wood.

Hill and Hibbert have found that the stability of certain cyclic acetals related to the cellulose nucleus varies markedly from chains composed entirely of car-

bon atoms. Experiments are in progress involving the synthesis of members containing from 10 to 18 atoms in the chain. A number of interesting suggestions were offered by Professor Hibbert as to the ease with which the formation of unsaturated groupings such as aldehydes, esters and methoxyl groups may take place in plant growths.

The committee on standard cellulose presented a double report. The first part contained methods and specifications for preparing a standard sample of pure cellulose, while the second covered the analytical methods involved in the examination of cellulose.

Dye History in America

The symposium on the coal-tar dye industry in the United States prior to 1914 began with a paper by Dr. Ellwood Hendrick, giving a history of the Albany Aniline & Chemical Works, which was organized in 1868 by Arthur Bott at the suggestion of A. W. Hofmann. He gave his own experiences, and told of the various chemists engaged in the effort up to 1884, when the bond holders foreclosed. He concluded with a history of the Hudson River Aniline & Color Co., organized in 1882, and of the American Aniline & Color Co., the absorption of the two companies by the Bayer Company and record of their products up to 1914 and later.

George A. Prochazka told of his beginning in the industry in 1882, of the incorporation of the Central Dyestuff Co. in 1898, and of the manufacture of various dyes and intermediaries under the supervision of himself and his brother John up to 1914. He gave dates and tonnages in regard to the various products, which included the remarkable statement that the company with which he was associated made and sold 100,000 lb. of eosine in 1897. This was before para-red succeeded it in paint.

Prof. Irving W. Fay, of the Brooklyn Polytechnic Institute, led the discussion on the teaching of dye chemistry along with the organic course, and suggested that it be taught by the case system, to make students think for themselves.

The paper by Dr. Charles E. Munroe and Miss Aida M. Doyle was read in abstracted form by Miss Doyle. It presented the efforts made by the government at Washington at various times to foster the industry.

Other contributions by Eugene Merz, W. J. Stainton, Herman A. Metz and J. F. Schoelkopf, Jr., were read by title, but will be published with the others. That of Victor G. Bloede, who was kept from attendance by illness, was read in part by the secretary, R. Norris Shreve. It brought up the question as to who was the first to make coal-tar dyes in this country. Dr. Hendrick thought it was the Albany works in 1868 under Arthur Bott. In the paper of Dr. Munroe and Miss Doyle the date was given as 1866, but the name of the maker was not added. And Mr. Bloede remembered a German in Brooklyn who had a little plant on the Edwardes Canal, as far back, if we recall the date right, as 1864.

THE STERLING CHEMISTRY LABORATORY

Section of Chemical Education

In the Section of Chemical Education George S. Counts made a plea for the needed research on the teaching of chemistry in secondary schools. W. H. Chapin reported on research problems which are fitting for teachers with limited time and equipment. Earl R. Glenn and Louis E. Welton presented a scientific study of the achievement of high school students in chemistry. Prof. R. A. Baker of Syracuse University gave a plan for grading large classes in chemistry.

Prof. E. G. Mahin of Purdue University proposed quantitative analysis as a study that replies to the instinctive questing within the minds of students as to what makes things go. Properly administered, it develops thinking and reasoning powers. Petty cheating, such as the manipulation of data and reports, are far tory than by rigid disciplinary measures. Prof. W. H. Chapin presented his method of teaching quantitative analysis, and Prof. H. R. Kraybill discussed the subject in relation to students of agriculture. Prof. Charles W. Cuno spoke of the need for more chemistry for engineers so that they may meet their problems in road building, electric furnace practice, metallography, etc. He wondered whether these subjects were not basically chemical. If they are, then how shall they be taught?

Prof. A. P. Sy of Buffalo University made a plea for a pedagogical scrap-heap in chemistry. Our concepts of chemistry are changing rapidly, and we should adjust our teaching methods to conform to modern ideas, especially to beginners.

The Chemical Education Section is becoming at once active and useful. The report presented by the committee on the correlation of high school and college chemistry did not meet with unanimous approval, which is natural, because the problem has not been solved as yet. But the discussion has got far beyond the old blame-shifting talk. That which is most earnestly sought is a better method of presenting chemistry to beginners, whether they are in high schools or colleges. It is generally recognized that the comparatively few high school pupils who go to college should not affect unfavorably the teaching of the large majority who do not go to college. It was clearly brought out, especially by Professor Sy, that we destroy the attractiveness of the study if we present features of the science to beginners that are not at all interesting to them then, while these same features become of intense interest later when the students come to learn their significance. It is not designed to make chemistry easy, or to use kindergarten methods. The purpose is rather to improve the order of teaching so that the sequence of things taught shall make the course in chemistry a living vital study, one that leads both to deductive and constructive habits of thought, and to the appreciation by the student of his greater understanding of the processes of nature.

Brief reviews of important papers presented before certain other divisions will appear in a subsequent issue.

Materials for Equipment Construction

A Symposium Reviewing the Field From the Standpoint of Present Practice in the Light of the Experience of Producer and Consumer

IT HAS seemed to us a good principle that the fundamentals upon which industries are built should be reviewed from time to time so that the milestones may be observed. Perspective changes. The things that once seemed important are not deemed important now. So there must be a healthy checking up that we may all know at least the direction in which we are moving.

In this symposium we have tried to assemble and focus the changes that have come to pass in the use of materials of construction for chemical equipment. It would have given an erroneous perspective to record the changes out of relation to the general background and so these reviews will reflect modern practice.

In general, the topics have been reviewed by an engineer with an impartial predilection for technical facts. In some cases we have enlisted a maker and a user of such a material to bring the contrasting views into the picture. It should be of service to the whole industry to have assembled here authoritative articles on the most important materials of construction, together with the limits in the use of each and its outstanding characteristics.

Important Considerations in the Construction of Wood Tanks

Proper Selection of Stock, Careful Design and Skilled Workmanship Essential—Need for Frank Co-operation of Users

BY CONRAD PENNUCCI
Engineer, New England Tank & Tower Co., Everett, Mass.

WOOD, being more resistant to the action of many acids than are other materials of equal or greater cost, is used extensively in the construction of tanks for the chemical and allied industries. The large number of wood tanks required annually has resulted in the establishment of factories devoted exclusively to their manufacture. Space limitations preclude the presentation here of the details of the technique of tank building and of the uses and adaptation of wood tanks in the chemical industry, but the writer will endeavor to cover in a general way the points that are considered of greatest importance.

The life of a wood tank in industrial use is governed mainly by three factors—the selection of wood, the skill and care used in the construction and the design of the tank.

The importance of selecting stock to be used in making a tank cannot be overemphasized. Not only must the natural resistance of the wood itself be taken into account but also the question of the available supply of the proper uniform grades that are "right" in respect to their quality and condition of dryness must be carefully considered. Only stock that is dry and thoroughly seasoned should be used. In general the greater the number of years intervening between the stump and the tank the better the tank. Such stock undoubtedly costs more, but in comparison is worth more than it costs.

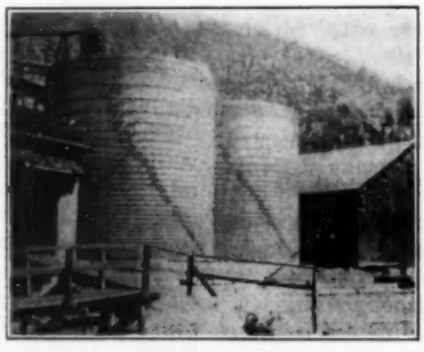


FIG. 1—WOOD TANKS AT PLANT OF CROWN WILLAMETTE PAPER CO.

The very definite constructional limitations of wood demand a close study of the design of the tank, and the importance of it cannot be disregarded.

Workmanship is the vital factor determining the life of the tank. A well-made tank of poor material will usually outlast a badly made tank of good material. While the equipment required in a tank shop is not generally extensive, it is of the greatest importance that the workmen be experienced in construction of this nature. Certain skill is required of tank builders that is peculiar to their trade and it has been found from experience that the most skilled wood worker in other lines cannot compete with the mechanic whose experience has been confined to the peculiarities of tank making.

NEED OF USER-MAKER CO-OPERATION

From the standpoint of both the user and the manufacturer, it is important to have information as to the purpose for which the tank is built.

There has been lacking between the users and the builders of wood tanks the frank co-operation absolutely essential to the development of the best possible equipment. This is a problem that cannot be finally worked out in the laboratory; such findings, while helpful, are often misleading and indicate doubtful preferences. Final decisions must rest on experience based on the service rendered by installations under actual operating conditions.

Very substantial savings would result to the chemical users of wood tanks by pooling their experiences with the manufacturers and frankly studying the problem together. Tank manufacturers have by years of experience acquired considerable knowledge of the varieties of wood and of the construction best suited to meet the different conditions of service.

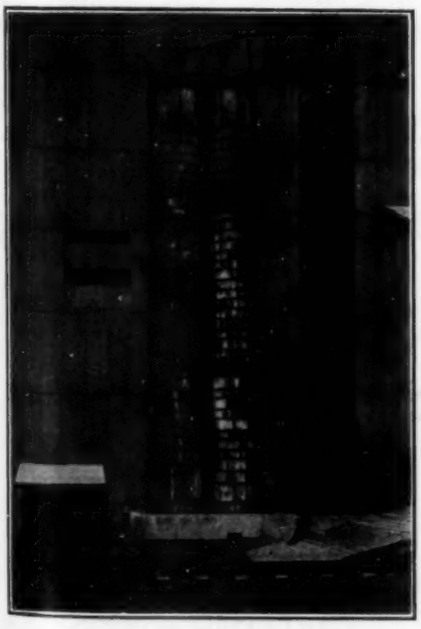
With such co-operation, ill-advised installations would be eliminated, material savings would be apparent at once, and in a few years the aggregate saving would be enormous.

Wood Pipe in Plant Construction

Its Wide Range of Utility in Chemical Engineering Industries Offers a Convenient Solution to Many Piping Problems

By Eugene H. Smith
The Michigan Pipe Co., Bay City, Mich.

Although comparatively little wood pipe is used today in the strictly chemical industries, it is gradually finding a broadening field of application in the industries dependent upon chemical processes, particularly those involving the handling of acidic or other highly corrosive liquids. Thus in the sulphite paper mills wood pipe is used for conveying the sulphite liquor, which because of its sulphurous acid content is extremely corrosive to most metals. In some mills wood pipe is used to transfer the dilute solutions of sulphite pulp from one part of the plant to another. Oil refineries find wood pipe a practical means of handling sulphuric acid wash waters. In steel plants maintaining galvanizing and tin plate departments, corrosive acid solutions are encountered, and in many instances it has been found necessary to use wood pipe in handling them.



WOOD PIPE TOWERS FOR HYDROFLUORIC ACID

A rather novel application of wood piping is found in white lead factories, where it is used for conveying CO_2 required in the manufacturing process.

Use in Fertilizer Plants

Wood pipe construction is becoming rather general in the fertilizer industry in connection with the towers for the collection of hydrofluoric acid from acid phosphate manufacture. The accompanying illustration shows such a system of towers. The layout is composed of three vertical towers of 48 in. inside diameter, the acid gas main being 30 in. inside diameter and the special wood elbows and tees are also constructed of 30-in. pipe. The pipe may be made in any lengths desired up to 16 ft., being constructed of 3-in. thick Canadian white pine staves, double-tongued and grooved on the lateral edges and molded on the inner and outer faces to conform with the inside and outside diameter of the pipe.

Each section of pipe is mortised and tenoned so that it may easily be set in place. The towers are tightened by the ¾-in. rod placed 10 in. apart, excepting at the joints, where the spacing is 4 in. to provide extra strengthening.

Wood Tanks for the Paper-Making Industry

Details in Design and Construction of Special Equipment Developed to Meet the Needs of This Industry

By L. E. Long
Engineer, National Tank & Pipe Co., Portland, Ore.

Proper selection of the variety and grade of lumber used, careful design and skilled workmanship and expert supervision are the essentials vitally important in the making of the best possible tanks for use in the chemical industry, and the users would profit by considering the tank from these four important viewpoints.

The manufacture of wood tanks for the paper-making industry is not a new enterprise. During the past 7 years, however, a special effort has been made to develop equipment particularly adapted to this industry's greatest need—viz., a tank to hold the acid sulphite liquor used in the digestion of wood pulp. It is believed that a description of the design and construction of such a tank may bring out a number of features of interest to chemical engineers in other industries.

These tanks are manufactured from the best quality clear Douglas fir. Heads and bottoms are finished 7½ in. thick and staves 5½ in. thick are hooped with ¾-in. round, soft-steel hoops, made in sections. Each section is fitted with a button head on one end, and 6-in. cold-rolled thread and hexagon nut on the other end. A specially designed malleable iron draw lug is attached to each hoop section to connect the various sections together and to tighten the hoops on the tank.

Figure 1 (page 676) shows sulphurous acid tanks at the plant of the Crown Willamette Paper Co., located at Floriston, Calif.

The blow-pit tanks, used for the discharge of the digesters, are manufactured from the same class of material, and have the same finished thickness of bottoms, heads and staves as tanks used for the storage of sulphurous acid. The blow-pit tanks, however, are supplied with a perforated false bottom. (See Fig. 2.) The holes in this false bottom are tapered ⅜ in. in diameter on the under side, and ⅛ in. in diameter on the upper side. The false bottom, made of 3-in. clear Douglas fir lumber and finished 2⅜ in. thick, is placed in the tank in the same manner as the bottom and head. The tank is also hooped with ¾-in. round, soft-steel hoops, having the same specifications as the sulphurous acid tanks.

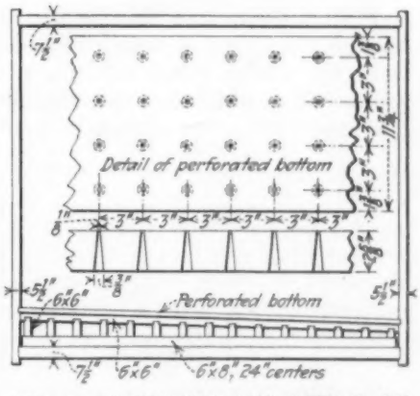


FIG. 2—ELEVATION AND DETAIL OF BLOW-PIT TANK

Acid-Resisting Irons

The Composition, Properties and Uses of These Important Materials Reviewed in the Light of Modern Practice

BY PIERCE D. SCHENCK
President, The Duriron Co.

ACID-RESISTING IRONS, frequently referred to as ferro-silicon or high-silicon irons, have become an important part of chemical plant construction. The composition of such irons is usually from 13 to 15 per cent silicon, with carbon, manganese, sulphur and phosphorous present in comparatively small amounts and the remainder iron. A better descriptive name for these irons would be iron silicides, as they probably consist of alloys of iron silicide and iron. Any elements outside of iron and silicon have a marked effect in diminishing the resistance to corrosion. The term "high-silicon iron" is indefinite and apt to be misleading. Comprehensive curves have been published proving conclusively that irons with silicon content of less than 12 per cent have little or no advantage over ordinary cast iron so far as resistance to corrosion is concerned.

Fig. 1 illustrates this point, although the curve is drawn to cover only the useful range of iron silicides. The resistance to corrosion increases with the silicon content,

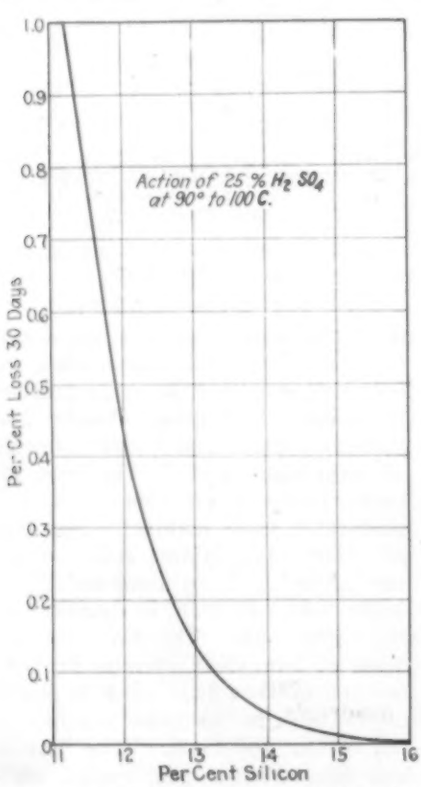


FIG. 1—ACTION OF 25 PER CENT H_2SO_4 AT 90 TO 100 DEG. C.

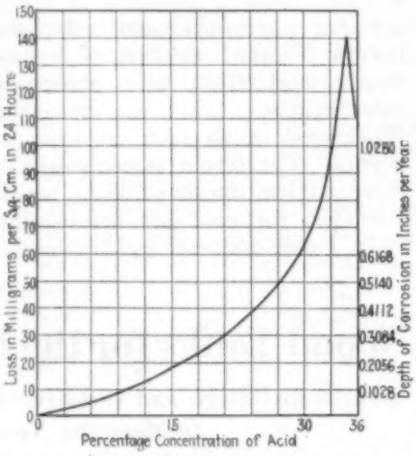


FIG. 2—EFFECT OF HYDROCHLORIC ACID AT DIFFERENT CONCENTRATIONS

but above 15 per cent the increased resistance of the alloy does not justify the higher cost of manufacture. Iron silicides, to give satisfactory results, must be manufactured under the most careful metallurgical control, as slight variations in composition, pouring temperature or cooling rate will have a marked effect on the acid-resisting qualities.

Where severe corrosive conditions are to be encountered a minimum silicon content of 14 per cent and a maximum carbon content of 0.80 per cent should be insisted upon. A higher graphitic carbon content has been found quite objectionable, as it not only lowers the resistance of the metal to corrosion but is apt to segregate and form pockets of pure graphite.

A lower silicon content, particularly if accompanied by an increase in carbon, will result in a rate of corrosion several hundred times as great as would be the case if the specifications mentioned were met.

Perhaps a more satisfactory method of determining the suitability of one of these alloys would be a depreciation test on a representative sample, made by keeping the sample in a 25 per cent sulphuric acid solution for 24 hours at a temperature of 90 to 100 deg. C. Great care should, of course, be used to maintain a uniform concentration of the solution. The loss in milligrams per square centimeter, under such a test, should not be over 0.08, an average of three such tests being advisable on very important work. Iron silicides that pass these specifications should be entirely satisfactory for use with nitric, sulphuric, acetic and, in fact, practically all commercial acids at any strength or temperature, with the exception of hydrochloric and, of course, hydrofluoric acids. Fig. 2 shows the effect of hydrochloric at different concentrations.

There are certain corrosives in the handling of which silicides should never be used, such as bromine, fused alkalis, hydrofluosilicic acid when concentrated, and the chlorides of sulphur. Others, such as caustic solutions, sulphurous acid solutions and certain sulphites, require careful consideration and possibly tests under specific conditions.

An important feature of these silicides is their almost universal resistance to chemicals under various conditions permitting standardization of apparatus. This advantage, together with the fact that apparatus of complicated form and considerable size suitable for high pressures and temperatures can be produced, has provided a construction material making possible on a commercial scale the use of processes which have been heretofore impracticable.

Several manufacturers, both abroad and in the United States, manufac-

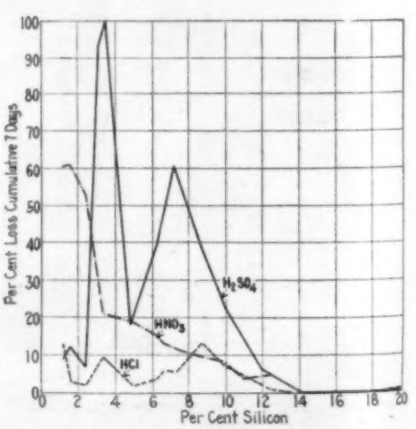


FIG. 3—VARIATION OF CORROSION WITH CHANGES IN PER CENT SILICON

ture standard apparatus such as valves, pumps, pipe, exhaust fans, etc., which are available in various sizes to meet general conditions. Unless the engineer is very familiar with the design and characteristics of silicides, the manufacturers' recommendations as to these points should be considered, as there are certain well-defined limitations of design which are peculiar to the material in question.

Large Containers

Stills and Tanks of Boiler Plate Are Usually Riveted—Welded Seams Have Certain Advantages, and May Now Be Made by Skillful Manufacturers With Dependable Joints Nearly as Strong as the Original Plate

By E. E. Thum

Associate Editor of *Chemical & Metallurgical Engineering*

LARGE containers, to operate at elevated temperature and pressure, are often needed by chemical engineers. At the present time, steel plate is the only structural material available in the necessary sizes, possessing the required strength and obtainable at a price. Naturally, a prerequisite to the use of large stills is that the contents will not react with commercial plate. The word "commercial" might be stressed, because the chemical engineer will find it impossible to obtain stills made of metal having special analysis or of alloy sheets, unless his order amounts to many hundreds of tons or he is justified in paying a very fancy price. Open-hearth firebox steel will ordinarily be found quite suitable. Some manufacturers of large tanks have pronounced ideas on the effect of small percentages of sulphur, phosphorus, copper or silicon, but the purchaser should bear in mind that the specific effect of these usual constituents of steel is far less than many unspecified factors which go to make up "best practice."

By their very nature, large containers must be fabricated of more than one piece. Riveting is the conventional method of jointing. Riveted joints have given satisfactory service in all classes of engineering structures for many years; their strength is easy to compute and has been proved by many tests; the shop practice is well standardized. Therefore a conservative engineer will often specify riveted joints, knowing that any reputable boilermaker can turn out a tight, workmanlike, dependable job. He will see to it, however, that the number of joints is kept to the minimum—each end should be "dished" of one piece; the entire bottom, inclosed in the firebrick setting, should be seamless. To meet such requirements, plate mills have been enlarged until it is now possible to obtain plates 15½ ft. wide and 40 ft. long—sheets which tax the railroad clearances for shipment.

However, riveted joints that easily resist water will develop leaks when handling light distillate. Even the tightest joint is hard put to remain tight when subjected to considerable temperature variations. Therefore much time may easily be lost with riveted connections through shut-downs to calk seams and redrive loose rivets.

If it is desirable to restrict the riveted seams to a minimum, why not dispense with them entirely? Such reasoning has led to the manufacture of "seamless" or "all-welded" containers. The American Society of Mechanical Engineers boiler code, however, does not permit the use of welded seams except for minor details, and then only allows the designer to figure a strength 55 to 65 per cent of that of the original plate. This specification tends to prevent many engineers from using perfectly safe welded joints having the highest efficiencies of any known method of joining metals.

Weld or Rivet?

The truth of the matter is that few engineers are able to give an intelligent answer to the question. Habit, precedent and even less reliable criteria are the bases of decision. Here the problem is discussed and a few axioms are laid down. It is a live, vital question and one that is constantly changing perspective as technological practice develops.

It would not be safe practice to give an ordinary repair man the job of welding up a pressure still. However, gas-, electric- and hammer-welding methods and practices have been highly perfected in quite recent times. A recent series of tests made by the Bureau of Standards on fifty large containers welded by gas flame or electric arc shows that if the seams are beveled both ways before welding (i.e., the welding is done from both sides and the added metal fills a "double V"), the welds may be conservatively figured at 80 per cent of the strength of the original plate. Low-carbon grades of boiler plate are recommended for such work, and the finished job should be tested at 50 per cent overload, hammering the weld during test.

Joint efficiencies as high as those in lap-welded pipe—90 per cent—can be expected in "hammer-welded" seams. This method merely adapts the methods of the blacksmith to very large pieces. Control is entirely automatic; heating is done by gas burners, and the hot seam is hammered together and worked down flat a short length at each operation. A strong joint is doubtless due in no small measure to the hammering which the heated metal receives.

However made, the completed still should be placed in a large furnace and carefully annealed—this to relieve any internal stresses due to the bending of plates or local heating. Not only does this practice allow the engineer to be assured that the metal is not laboring under high initial stresses before it is put to any useful work, but removes the liability for "season cracking"—a peculiar and dangerous brittleness rapidly induced by nitrate and other chemical solutions.

Six Kinds of Riveted Seams

E. E. Rohrer of the Coatesville Boiler Works suggested this listing to us:

In general there are six types of riveted joints: First, the lapped and single riveted seam is almost entirely used for storage tank work. The efficiency of this type of seam is approximately 50 per cent. Second, the lapped and staggered double riveted seam, used where medium pressure may be required. The rivets in this type of seam are usually about 1 in. greater pitch than for the single riveted seam. This type of joint has an efficiency of about 70 per cent. Third, the lapped and triple riveted seam is comparatively seldom used. Fourth, the butt strap double riveted seam (the butt strap seams here mentioned inside and outside butt straps) has an efficiency of about 82 per cent. Fifth, butt strapped triple riveted seam, having an efficiency of about 87 per cent. Sixth, the butt strapped quadruple riveted, having an efficiency of about 93 per cent; these latter two are used on larger diameters and for higher pressures.

Metals for High Temperature

No One Alloy Can Be Used as Standard—Each Has Its Limitations and These Must Be Appreciated in Order to Ward Off Failure

By F. A. Fahrenwald
Consulting Engineer, Cleveland, Ohio

MANY chemical processes require the use of metallic containers or mechanical units at high temperature. In such circumstances the degree of commercial success is measured by the degree of stability of these units under manufacturing conditions.

A score or more "heat-resisting" alloys have been offered to meet these requirements. The term "heat-resisting alloy" has come to be blindly used by the purchaser and so misused by the vender without regard to the kind of heat to be encountered or the nature of resistance required. As a consequence, the general effect is so unsatisfactory that the user or designer of high-temperature equipment has come to underrate the possibilities of heat-resisting alloys. The term "heat-resisting," like good or bad or high or low, is merely relative. Any material is heat resisting only to some particular set of requirements.

Therefore, it is no more feasible to make one heat-resisting alloy for all high-temperature uses than it is to make one single, all-purpose grade of steel for watch springs, cutting tools, bridge construction and gas pipe.

The Difference Between 25° and 1,000°

It seems difficult to visualize conditions as they would obtain if our normal temperatures were around 1,000 deg. C. instead of 25 deg. C. (as it happens to be for perhaps only this one body in the universe), but this mental adjustment is necessary if the design and materials of equipment for use at the upper temperature are to be satisfactory. As a matter of fact, most failures in high-temperature equipment are not due to a lack of quality in the materials themselves so much as to an improper application due to this inability on the part of either the manufacturer or designer to think from any plane other than that established by the normal temperature and pressure of early courses in physics.

Many structures and devices designed for operation at 1,000 deg. C. are based on data and engineering conditions for ordinary temperatures. When put in operation they suffer the same fate as would the ether-plane of an aviator who from some cold planet attempted to make the trip to earth in a flying structure made up of materials which gave best service under his normal conditions. He would not, of course, use iron or steel, because these show a tendency to brittleness at his low temperatures and he would no doubt employ struts and braces of copper, aluminum or zinc, with perhaps castings of mercury for certain parts of his mechanism, and if he had made no greater allowances for thermal expansion or the weakening of his materials with increasing temperatures than do many of our mundane designers the wreck of his arrival would be no greater than those which happen here.

A timely caution from a very wise metallurgist! When users of metals at high temperatures are able to forget conditions at 25 deg. C. and the ordinary tests and think in terms of 1,000 deg., then there will be less failure. Perhaps then we shall not use an alloy in an oxidizing atmosphere which is of use only under carbon monoxide. Here at least is a prophet whom we should heed.

Corroded surfaces, warped, sagged and cracked structural members, and other types of failure at high temperature have been blamed on the alloy itself when the true cause is that the material and design was not fitted to the particular requirements, or the impossible attempted.

Any metal or alloy is heat resisting with reference only to some clearly defined set of requirements. Thus, tungsten is a very superior heat-resisting material in an atmosphere of nitrogen, argon, or in a vacuum, but tantulum, while nearly as refractory, cannot be used in nitrogen, and neither of these is as heat resisting as ordinary cast iron in open air. Platinum is very heat resisting in open air, but in an atmosphere of CO gas or metallic vapors or in contact with certain salts it is unstable at quite low temperatures. Lead is more heat resisting than nickel or iron when in contact with sulphuric acid, and iron is a better material than platinum for lead pots.

These perfectly obvious examples, which could be multiplied many times, are given merely to illustrate the fact that in so far as resistance to corrosion is concerned any given metal or alloy is "best" with reference to some one set of conditions only. Resistance to corrosion (scaling and oxidation), however, is not the only criterion to be used in selecting equipment for high-temperature operation. If this property alone were required, it would be a relatively simple matter to meet very rigid requirements. The real difficulty lies in combining chemical resistivity with the necessary physical or mechanical stability. As a matter of fact most failures observed in heat-resisting alloy units are due to cracking or warping and not to surface deterioration.

Mechanical Properties at High Temperatures

It must be remembered here that the mechanical properties of iron, nickel or heat-resisting alloys at 1,000 deg. C. are not those revealed by ordinary physical tests and that these materials at high temperatures are very much like copper, lead or zinc at ordinary temperatures. A hearth plate of steel or heat-resisting alloy will, for example, flow or bend slowly at a temperature of 2,000 deg. F. just as a lead shingle will "creep" down the side of a roof in the hot (high-temperature really, for lead) sunshine. A tensile or bending test carried out at a temperature of 1,000 deg. C. on a typical heat-resisting alloy will show an apparent strength of 25,000 lb. per square inch under a quick pull, when as a matter of fact its effective strength under continuous dead load is only about 5,000. A structural unit may therefore vary five to one in cross-section, depending upon whether designed for intermittent service or to resist permanent stresses.

High-temperature stiffness, hardness or strength may be obtained by proper alloying, but usually at a sacrifice of some other property, just as in the parallel low-temperature example of hard lead for type metal. Again, it would be relatively easy to provide for the combination of a certain kind of chemical resistivity with some specific set of physical or mechanical properties for some definite narrow temperature range; but often one must provide for rapid fluctuations of 1,000 deg. temperature, with the accompanying tremendous forces of thermal expansion. One high-

temperature process, for instance, may require resistance to a certain type of corrosion and in addition, one other property to a maximum degree —such as high tensile strength, or stiffness, or resistance to cracking or abrasion while hot, or a high degree of machinability or ductility while cold to facilitate fabrication. Another process may require the combination of three or more special properties, and it is not difficult to think of only two which can hardly be combined in the same alloy. It is easy, for example, to combine resistance to scaling in open air or ordinary gases of combustion with a high degree of ductility, strength and machinability while cold, but it happens that if these surrounding gases contain a small percentage of sulphur, maximum resistance to corrosion has been found only in alloys which are quite brittle and non-ductile cold and not particularly resistant to warping and cracking at high temperatures. An alloy which has been found to be very resistant to molten lead is quite fragile cold, but machineable — a property not required for this purpose—while another alloy well suited to withstand abrasion in continuous furnaces of a certain type is too hard and so cannot be fabricated into the required forms. These examples are given to show that it is often necessary to accept certain seemingly objectionable features in an alloy which contains to a maximum degree the one particular type of high-temperature stability required and that alloys for use at high temperatures must not be judged by "standards" developed for ordinary conditions.

Practically all of the "heat-resisting" alloys at present on the market are composed of chromium together with one or more of the iron group metals, with minor additions of other elements to impart certain desired characteristics. Maximum operating temperatures — limited by the character of these constituents— are thus necessarily low, but it is not at all unlikely that super-refractory alloys will be available in the near future. It is unfortunate that one cannot go to a handbook for exact and detailed information concerning the behavior of such metals at high temperatures.

So without attempting to advise on specific cases, I would urge a proper consideration of those factors which make for success or failure in high-temperature equipment.

Corrosion-Resisting Irons and Steels

Interesting Discussion of the Corrosion Resistance of Pure Iron, Chromium Steels and Silicon Cast Irons

By James A. Aupperle
Chief Chemist, American Rolling Mill Co. Middletown, Ohio.

AT THE outset, one must admit that only a service test will determine whether a metal will resist chemical reagents. This has been found true so often that at times the chemical engineer hesitates to guarantee the performance of any particular metal if he suspects that the operating conditions are slightly different from those with which he has been formerly dealing.

Consequently it is unnecessary to warn the experienced man not to rely too much upon laboratory tests. As ordinarily conducted, they give no more than a rough general indication of the service to be expected. So little is known about the mechanism and true nature of corrosion, and so much depends upon the kind of reaction product—whether loose or adherent, pervious or tight, inhibitive, accelerator or catalyzer—that it is hard to predict what will happen during the fiftieth day, for instance, based upon the results observed during the first day. A consideration of great importance in this connection is whether the salt solution in contact or formed by corrosion will hydrolyze easily with the concomitant formation of acid concentration at those particular regions. Aluminum sulphate is an instance. Impurities in the liquids to be handled sometimes give startling troubles; the amount of oxygen held in the solutions is also a very important factor. A recent test on coal mine waters of the Pittsburgh district containing a wide variety of sulphates gave very puzzling and inconsistent results for these very reasons.

Broadly speaking, in order to obtain a ferrous metal which approaches non-corrodibility it is necessary to render the iron, by suitable alloying, insoluble in the reagent in question, or to make the iron as pure and homogeneous as possible in order to avoid electrolytic or galvanic effects among the different micro-constituents.

Chromium is the element usually added to steel, and silicon is the element usually added to cast iron (in considerable percentages in both classes (to make the alloy insoluble in reagents. Thus we have many kinds of "stainless" steels and high-silicon irons on the market. Great purity in the iron has also been found to be very efficacious in resisting corrosion under many diverse service conditions, which include ground waters and very dilute solutions generally. This is the idea upon which "commercially pure ingot iron" is produced. Possibly the same reason underlies the remarkable preservation of many wrought-iron objects— the iron crystals in this material are quite pure, the so-called "impurities" in this material being concentrated in the slag inclusions.

It should be remembered that chromium steels and more complex steels will often give disappointing results when subjected to the action of acids. Table I illustrates this point by corrosion tests which were made at room temperature.

From these results it will be noted that there is a remarkable difference between the various grades of stainless steel, especially in the acid solutions. In the 5 per cent hydrochloric acid solution, one grade of stainless steel showed forty times as much corrosion as commercially pure iron. A great difference is also noted in the results obtained using 5 per cent acetic acid solution. One type of stainless steel lost practically nothing, while other types of stainless steel lost more than the commercially pure iron.

Commercially pure iron has been successfully employed to resist the action of 20 per cent aluminum sulphate solution and also to resist the action of boiling ammonia (sp.gr. 0.90).

Great strides have been made during recent years in the vitreous enameling industries, by which proc-

TABLE I—LOSSES IN OUNCES PER SQ. FT.

Material	5 Per Cent Hydrochloric A. 100 Hr.	5 Per Cent Acetic Acid 100 Hr.	Distilled Water 100 Hr.	3½ Per Cent Sea Salt 100 Hr.	Moist Salt 300 Hr.
Commercially pure iron	0.211	0.034	0.019	0.021	0.075
Stainless steel "A"	8.118	.001	.002	.002	.005
Stainless steel "B"	.188	.046	.001	.001	.004
Stainless steel "C"	2.534	.055	.006	.008	.007

ess a glass-like coating having wonderful acid and alkaline resisting properties is fused onto the metal. Light gage sheet metal can be employed in the chemical industry when an enameled coating is used. The enameled coating is very light and approximately three times as thick as the average metallic coating on sheets. It has been found that utmost homogeneity in the base is necessary if the coating—either of metal or of enamel—is to be absolutely continuous. Included impurities in the base metal almost invariably mark the location of defects in the coatings.

It is obvious that a linseed oil paint should not be used on structural or other material where alkalis predominate, as alkalis would have a tendency to saponify the linseed oil in the paint and thus destroy its usefulness as a protective coating.

A very efficient protective coating which has been used successfully by sulphuric acid plants is coal tar of the consistency of molasses, thinned with the use of benzol if necessary and containing about 10 per cent by weight of dry portland cement. A coal-tar paint of this character can be made up cheaper than any other type of paint, and has been found very satisfactory. The cement will combine with the acids and water sometimes present in coal-gas tar and water-gas tar. The paint should be applied with the use of a sprayer, and the paint should be kept agitated while being sprayed.

Use of Copper and Its Alloys in Chemical Engineering

Easy Fabrication and Resistance to Corrosion Make Them Some of the Most Useful of Construction Materials Used by the Chemical Engineer

By William G. Schneider
Copper and Brass Research Association, New York City

COPPER has been in use so long that it is usually taken for granted that everybody knows all about copper. Perhaps that habit of thought explains why, in many instances, the broad, general utility of copper has been somewhat lost sight of behind an impressive series of laboratory tests, featuring "successors to copper." The final test of a metal's service value is actual use; and it is a matter of record that in many instances expensive apparatus built of, or using, materials whose reputations were made through special or laboratory tests failed because, in actual operation, conditions were present which could not have been comprehended in the laboratory. Accelerated corrosion tests have repeatedly demonstrated other metals as equally non-corrosive as bronze. Yet the engineer has made the bronze pump practically standard for the handling of acid mine waters, not only because bronze stands up well but also because the bronze pump is readily repaired on the job. To be sure, some of the newer alloys constantly coming to the fore are more resistant to certain forms of corrosion. In many cases, however, these are so difficult to machine, weld, forge or otherwise work that if a break occurs the entire plant or unit is thrown out of operation.

Since the major responsibility of the chemical engineer is quantity production at a profit, and his tools are pumps, coils, tanks, digester, condensers, evaporators, kettles and similar apparatus, his most valuable metal is that which possesses to the greatest extent a combination of the essential qualities of easy fabrication, heat conductivity, non-corrodibility and strength.

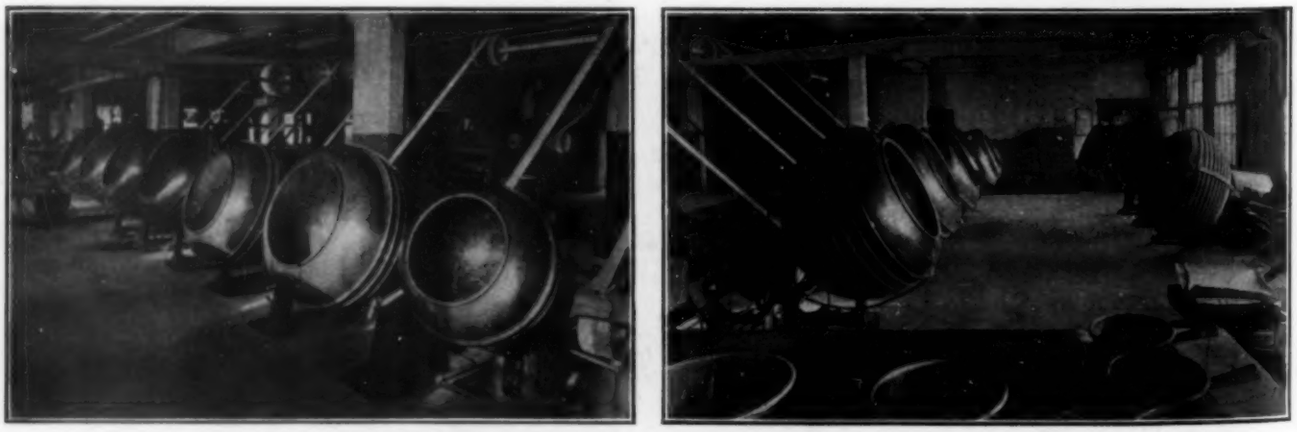
Easy fabrication and its non-corrosiveness are the reasons why copper has been selected for so many types of apparatus used in the chemical and allied industries. But the very ease with which copper is made into even intricate shapes has sometimes earned for it unjust condemnation and criticism.

The naturally close, homogeneous structure of copper has occasionally been weakened by careless manufacture, with the result that instead of developing the inherent valuable properties of copper, they have been destroyed at the expense of its serviceability.

Copper varnish kettle bottoms, condensing equipment, candy kettles, milk evaporators, soup kettles, kettles in which sweet fillings for crackers are prepared, and other chemical equipment, carefully fabricated, are still in active service after 30, 40 and 50 years of continuous use.

A very desirable feature of copper, aside from its ability to withstand the abrasive and corrosive actions of the various materials used in the plant, is its factor of safety. Subjected to high pressures, if it fails copper does not "let go" at once but rather gives warning and time to get out of harm's way. Other metals of brittleness and rigidity which have their elastic limit too near or equal to the ultimate strength fail all too suddenly.

As extensive as the use of copper



REVOLVING PANS, FABRICATED OF COPPER, USED FOR SUGAR COATING CANDIES

COPPER-JACKETED STEAM KETTLES, USED FOR COOKING "GUM" CANDIES, OPERATING UNDER 85-LB. STEAM PRESSURE

already is, there are other uses, aside from apparatus, where it would seem logical and economical to use it. Copper, brass, bronze and other copper alloys have made good in condenser equipment for the handling of excessively corrosive fumes and liquids. Sheet copper ducts in ventilating systems, particularly in chemical plants, indicate an advantageous use for copper. The commonly used materials are, to be sure, cheaper, but the success with copper in outdoor service of a similar character is a strong argument in its favor.

In conclusion there is one consideration that cannot be overemphasized. Once the chemical engineer has selected copper or one of its alloys because of its resistance to corrosion or abrasion in connection with his particular problem, he would do well to consult with the experienced fabricator regarding the actual construction of his equipment.

Copper, brass, bronze or other copper alloys are not "cure-all" metals, but when they are properly used and installed they offer advantages in the chemical industry that cannot be surpassed by commercially practical metals.

When Copper Should Be Used in Chemical Equipment

A Résumé of Some of Its Desirable Properties as Well as Definite Limitations as a Structural Material

By John A. Steffens

Consulting Chemical Engineer, Brooklyn, N. Y.

THE use of copper and its alloys in the chemical industry is dependent on the property of resistance to corrosion combined with good structural characteristics. Copper may be readily worked into requisite forms, although the methods of the coppersmith differ from those of the iron worker. Supplies of the metal are relatively abundant and cheap and when resistance to corrosion is necessary, the use of copper is usually most economical.

But copper does not universally resist corrosion. Substances containing ammonia and its derivatives in the presence of water attack it quite vigorously, likewise nitric acid and some of its derivatives. Some sulphur compounds will cause the formation of copper sulphide, and if the surface be subject to fluid flow sufficient to erode the layer of the sulphide, progressive corrosion occurs. The usual practice of tinning the copper surface is no deterrent to this action.

Oxy-acids, such as lactic, tartaric and malic, have a variable action, apparently dependent on the concentration of water, temperature and presence of air. Maleic and fumaric acids attack copper and its alloys. A curious phenomenon is the solution of copper and tin in the anhydrous formic esters, stable crystalline compounds being formed. Further instances of specific corrosive action might be mentioned, but suffice it to say that each substance and process requires testing under working conditions.

Use in Alcohol Industries

Despite the instances of corrosion which have been given, the general usefulness of copper in the chemical arts is great and its use is increasing. In the alcohol industry, copper stills are standard equipment. Properly built, a life of at least 10 years may be expected. The small quantities of impurities in alcohol rapidly corrode steel and wrought iron. Cast iron is fairly resistant, but is more costly and cumbersome and, in addition, usually of smaller capacity than similar copper equipment.

In working the products of wood distillation, copper equipment finds extensive use. Methanol, acetone, methyl acetate, dimethyl acetal, aldehyde and other substances have less action on copper than they have on iron.

For the manufacture of esters, copper columns are most commonly used, and where kettles are used, they are usually of copper. Some of the rarer esters require enameled kettles. For the manufacture of ethyl acetate, copper is exclusively used. The acetic acid, except in the presence of air, has little action, and the dilute sulphuric acid practically none.

The use of copper in heating surfaces is extensive. Burnished copper kettles are a common sight in the food industries. Copper tubing in evaporators is common.

To sum up, copper is used to replace steel and wrought iron wherever it satisfactorily withstands the corrosive action of the materials to be processed. Further consideration of this general basis of choice of material leads us outside the field of chemical equipment.

Jacketed Cast-Iron Kettles

Certain Fundamentals Which Are Desirable Features When Cast-Iron Kettles Are to Be Used

By R. C. Boggess
Manager, Dopp Sales, Sowers Manufacturing Co.

THE extensive use of jacketed kettles in chemical industries is so well known that it hardly needs comment. The jackets are used for steam, for hot oil, for heating batches and cooling them quickly with cold water, for a thousand and one kinds of chemical reactions in liquid phase. Therefore a brief consideration of a few of the desirable features of jacketed kettle construction will be distinctly worth while. Quite naturally the problems which are considered in this paper are in general problems that we have encountered in the manufacture of the Dopp kettle, and it is perhaps pardonable therefore to mention the successful solution of some of them.

For example, there are many distinct advantages in casting the kettle, the jacket and the reinforcing connection between the outer and inner shell all in one piece. There are no rivets, bolts, seams or joints that work loose with the repeated contraction and expansion inevitably experienced in this type of apparatus. No leaks are possible such as occur frequently in two-piece kettle construction.

Again, the composition of the iron which goes into the kettles must come in for very serious consideration. In the first place, the tensile strength should be high, for in the larger type sizes of kettle the demands are rather severe on the metal itself, and second, the corrosion factors must be considered. As a matter of practice it has been found desirable in our works to use a special iron high in silicon and low in manganese and phosphorus, which has a tensile strength of from 35,000 to 40,000 lb. per sq.in. The silicon content must be balanced, of course, to avoid on the one hand brittleness, and on the other hand rapid corrosion.

Rapid Heat Transfer Desirable

It is worth while recording an interesting test that was made on one of the Dopp kettles and that illustrates a principle worth remembering. The inside of the kettle was coated with a thick grease and steam was turned into the jacket. In a short time the grease melted in around opposite of each of the stay bolts, showing conclusively that these bolts actually conduct the heat into the kettle at a more rapid rate than the surrounding iron. Thus it comes about that the stay-bolted construction and single casting which is standard practice in our fabrication has facilitated the heat transfer.

It is quite essential that kettles of this kind be tested to a high hydrostatic pressure before shipment, and it is safe practice to use twice the working pressure of the steam. This applies not only to the jackets but to the kettle itself if it is to be used for pressure or vacuum work. The use of high temperatures in jacketed kettles is, of course, possible now with heated oil, and temperatures of 575 deg. F. can be reached and maintained inside the kettle. With this kind of a process it is essential to have a leak-proof jacket. In such cases a welded steel jacket has no counterpart in cast-iron work except a one-piece cast construction. There the oil simply can't get out. There are other points which unfortunately have to be regarded as trade secrets and are, therefore, of less interest to the technical man in a symposium than to his other self when he acts as purchasing agent. For example, by specially controlling the casting process and keeping the metal away from the molding sand a smooth surface can be obtained on the iron and no machining or grinding is necessary. This process leaves a protective skin on the surface of the iron which acts as a protective coating.

Aterite

Its Interest to Manufacturers and Users of Chemicals Lies in a Combination of Resistance to Corrosion and to High-Pressure, High-Temperature Work

By Foster Milliken, Jr.
President of Aterite Co., Inc.

RESULTS are usually achieved by effort, but on rare occasions by accident. When Aterite was first conceived, the idea in view was to produce an alloy of certain definite characteristics, and toward this end entire success was met. By a strange coincidence it was found that in addition the resultant alloy had properties more valuable than any originally contemplated, which automatically brought it into a field where previously far from satisfactory results had been obtained by the use of other metals.

Since its introduction in the early part of 1916, Aterite has been used with remarkable success for two primary services—in connection with chemicals and for high-temperature, high-pressure work.

Chemical

To be of value in handling chemicals, a metal must possess certain primary attributes. First, of course, it must be resistant to corrosive action, and second, of almost equal importance, it must be resistant to erosive action. In addition it must be readily machinable, so that without the necessity of special equipment the average mechanic can make the necessary repairs. The metal must have a certain amount of strength and ductility in order to withstand the hard usage it is oftentimes called upon to bear at the hands of unskilled workmen. It must have all these characteristics as well as more minor ones and still be within a price which is not prohibitive.

While Aterite will not resist the corrosive action of all chemicals, still it is proof against those most commonly used, and in addition possesses all other attributes mentioned above.

A concrete example comes to mind. Probably one of the most severe cases is on an acid agitator used in oil-refining work, where during the course of operations the sulphuric acid is changed from strong to very dilute. In such a service a certain refinery had got a maximum service of only 42 days, whereas an Aterite valve has now functioned without interruption for over 6 years. This is only one of many cases and likewise applies to many other acids, such as acetic, hydro-

fluosilicic and chemicals such as aluminum sulphates, etc., to say nothing of kindred lines like vulcanizing.

Temperature

For high-temperature, high-pressure work a most careful study must be made of a metal's characteristics, as failure is apt to be of a most disastrous nature, both to property and life. To be of value the metal must have many well-defined attributes.

Too many engineers are prone to consider tensile strength as a deciding factor, when instead the yield point should be of main consideration. A metal for temperature work must not only have a high yield point but at the same time a good reduction in area and elongation. It must of necessity be dense, but at the same time exceedingly ductile, so as to give adequate warning before letting go. It should have a low coefficient of expansion and contraction, or if used with other metals, one which compares favorably. In addition the metal must have a high melting point and above all retain its properties at high temperatures.

Aterite possesses each of these requirements to a marked degree, making it an admirable metal for high-temperature, high-pressure work. For valve work in such a service it is particularly suited, being the only known metal of which an entire valve can be constructed, thus completely eliminating any difference in expansion or contraction of parts. Heretofore forged steel has been widely used, but after reaching temperatures of from 800 to 900 deg. F., it rapidly deterioriates. Aterite has been used in various forms, such as valves and fittings on superheated steam lines, even as high as 1,250 deg. F., 250 lb. pressure, without any deterioration.

And so, through a coincidence, the alloy Aterite has been found and proved successful for the handling of chemicals and also for high-temperature, high-pressure work.

Notes on Brasses and Bronzes

They Resist Mild Corrosion—More Severe Conditions Met by Alloying With Manganese or Nickel—Tin Forms Very Sensitive Compounds With Nitrates

By Harold F. Whittaker

THE simple brasses and bronzes are not very widely used as corrosion-resisting metals in the chemical industry except under those conditions where relatively mild corrosive conditions exist. Each of these alloys resists normal atmospheric corrosion fairly well. Various bronzes have been used to a large extent in contact with sea water, where they are used in ship propellers and sheathing. In spite of the fact that serious corrosion difficulties were encountered by the United States and British navies during the war, brass is still considered to be far superior to steel for condenser tubes. Corrosion of brass condenser tubes has been divided into five classes. Various methods have been used to overcome the various kinds of attack, but the best method so far found has been a frequent, thorough cleaning of the tubes to remove all deposits or scale.

There are some places where brass and bronze give satisfactory service in the chemical industry. Either will withstand boiling 10 per cent sodium chloride satisfactorily, and bronze resists corrosion fairly well when in contact with warm sulphurous acid solutions. There is one place in the chemical industry where bronze is apparently superior to all other commercial metals as a structural material—manganese bronze resists 85 per cent formic acid exceedingly well; in fact, it lasts almost twice as long as pure copper under similar conditions. This alloy is also known satisfactorily to resist warm dilute sulphuric acid solutions ranging in concentration between 1 and 2 per cent and under such conditions will outlast brass about two and a half times.

There are several places in the chemical industry where brass or bronze must not be used. One of these is in connection with the handling or storage of ammonium nitrate. Although these alloys are not known to form explosive corrosion products, these products have a harmful effect upon the ignition point of certain explosives in which ammonium nitrate is used. Tin is thought to form sensitive compounds with ammonium nitrate, therefore tinned containers or bronze parts should not be exposed in any of the operations in connection with ammonium nitrate.

A rather unusual but interesting type of corrosion takes place between copper, brass or bronze and organic amino compounds such as aniline, toluidine, etc. The copper of these metals readily replaces one of the hydrogen atoms of the amino group, the corrosive compound forming a thick crust on the metal surface. This crust is neither adherent nor protective. The above reaction is usually considered to be a high-temperature reaction, although instances are known where 3 per cent solutions of aniline in hydrocarbons have readily attacked copper at ordinary temperatures.

It might be well to call attention to types of the complex bronzes which have been designed particularly to overcome corrosive conditions. Examples of these complex bronzes are Aterite, which is a nickel brass; Meco metal, a copper nickel zinc alloy, and Ampco, one of the aluminum bronzes containing principally copper, aluminum and iron. There are several similar alloys on the market, but in most instances their compositions are concealed by alloy numbers or trade names. Some of the above alloys have variable composition, hence a suitable composition may be selected for specific corrosive conditions. Most of the above alloys are usually subjected to some working or rolling process previous to their fabrication, since their resistance to corrosion is increased and they possess greater structural strength. The manufacturers recommend these alloys for use with superheated steam, hydrofluoric acid and the organic acids as well as some concentrations of sulphuric acid and sulphurous acids. They are not usually recommended for use with chromic, hydrochloric, nitric, picric or mixed acids nor for ammonium hydroxide. Pure copper is usually considered to be superior to any alloy for handling hot dilute acetic acid. Much better life is obtained from these alloys when arrangements are made to keep oxygen or oxidizing materials away from them when they are exposed to corrosive conditions. It may be of interest to note that one of the above alloys was designed for the purpose of eliminating the necessity of casting under pressure. As far as the writer has heard the alloy gives excellent results in the foundry without the use of a riser.

In any case, where brasses or bronzes are being considered, it is advisable to carry out corrosion tests as nearly as possible under operating conditions.

Aluminum for Chemical Construction

Properties That Favor Its Use for Equipment Fabrication and a List of Uses in Chemical Industries

By E. Blough
Aluminum Company of America

CHEMICAL ENGINEERS are always seeking for materials to improve their plant equipment. Each industry has its own problems in this respect, so a recital of some of the experience gained in the use of aluminum in chemical equipment may prove of use to those engaged in this profession.

Since the utility of the material is based, first, upon its chemical behavior and, second, upon its mechanical properties, it has been found by experience that pure aluminum is more generally applicable to chemical apparatus than its alloys (with an exception noted below). It is always desired that the chemical or product will react as little as possible with the container, and whenever the container is acted upon, the products of the reaction should be colorless.

Pure aluminum tanks, vats, tubing and coils fulfill this requirement. Since the metal is generally used in the soft or annealed condition, the tensile strength may be considered 12,500 lb. per square inch for purposes of design. This figure may also be used as the tubing strength.

It has been found more satisfactory to make pipe fittings of an alloy containing a small amount of manganese, as this alloy gives a casting which may be subjected to a high internal pressure without "sweating."

The shapes in which apparatus can be built are almost limitless. This is due to the fact that aluminum can be formed by drawing, spinning, beating, bending or by any other commercial method. The parts thus formed can be welded together autogenously so that a seamless (without rivets) vessel may be constructed of any size or shape to suit the particular needs of the chemical manufacturer.

A description of some of the uses to which aluminum has been put in the chemical industry may prove of interest and use to those engaged in the manufacture of chemicals.

With a few exceptions, as might be expected, the greatest success has been attained in the organic field. One exception is the use of aluminum tubing in sulphur wells in place of iron tubing. Another use in inorganic chemical manufacturing is for crystallizing pans for ammonium sulphate.

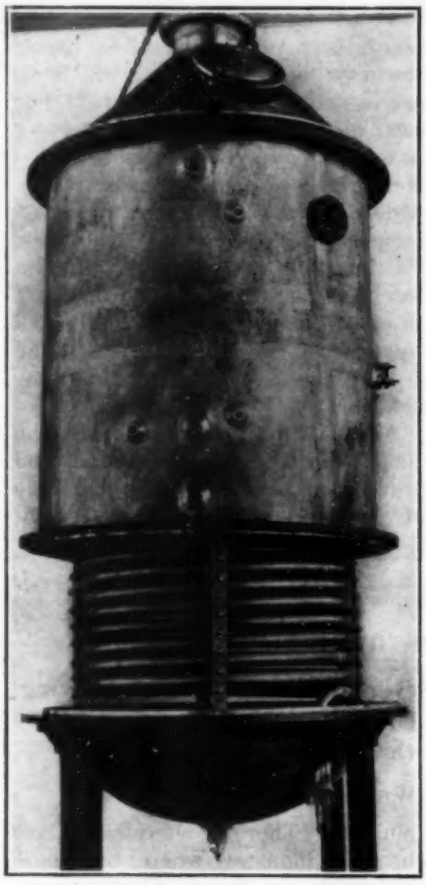


FIG. 1—STILL 14 FT. HIGH DESIGNED FOR INDIA REFINING CO

Aluminum is used for vinegar containers and also for piping. There are also several large installations where it is used as storage tanks for acetic acid.

In the forest product field it is used for turpentine stills, wood distillation stills and in this same general field for varnish kettles.

Formaldehyde shipping containers of aluminum have proved very satisfactory.

Gasoline fuel tanks of aluminum are widely used, particularly in aircraft. Similarly, aluminum parts in gasoline pumps for service stations have been approved by the Underwriters' Laboratories.

Aluminum wax cooling pans have an almost limitless life in the preparation of paraffine wax and do not in the least discolor the wax to the detriment of candles.

Condensers and deodorizers are made of the pure metal in the vegetable oil industry, as for example in connection with coconut oil.

Gelatine and glue manufacturers use aluminum for cooling pans.

Tartaric and citric acid manufacturers use aluminum crystallizing pans.

Rubber curing pans are made from aluminum.

The list might be extended and new uses are found each year. A typical apparatus that has been developed is illustrated in Fig. 1 and shows the adaptability of aluminum to chemical manufacturing.

Nickel and Monel Metal

A Brief Note on the Properties Which Give These Metals a Unique Value in Corrosion-Resisting Work

By R. J. McKay
International Nickel Co.

CERTAIN qualifications are desirable in a metal for corrosion-resisting machinery aside from actual resistance to corrosion. It should possess high strength, particularly in such utility tests as resistance to fatigue and to impact. It should be easy to machine, forge, cast, weld, solder, etc. An alloy should be of such a standard character that the composition does not change and the supply be constant and dependable. Knowledge regarding all its properties should be available and acquaintance with such common characteristics as methods of working, resistance to corrosion, etc., should be widespread.

The increasingly extensive use of pure nickel and Monel metal seems to indicate that they possess a healthy percentage of these properties. For example the tensile strength for hot-rolled Monel metal is 90,000 lb., for nickel 75,000, and the yield points 50,000 and 25,000 respectively. These properties and the hardness and ductility can be controlled within limits by proper working. The metals can be machined, forged hot or cold, cast, cold-drawn, brazed, soldered and welded. Spinning requires considerable power and frequent annealing; high temper cannot be produced.

The Izod impact resistance of Monel metal is 114, as compared with mild steel 77 and forged copper 46. It resists acid corrosion by virtue of

its relatively low position in the electromotive series and oxidation by the pacifying effect of its 67 per cent of nickel. Combinations of as strong oxidizing agent as an acid solution will corrode it. Its corrosion resistance does not depend on protective coatings, and therefore it is relatively resistant to effects of high velocity and abrasion in conjunction with corrosion. Further work is being carried out on these metals in order further to justify the present confidence.

Enamel-Lined Apparatus

Vitreous Enamels Constitute a Type of Surface for Chemical Equipment Which Is Useful With Both Corrosive Materials and Those Which Must Not Be Contaminated

By Edward G. Miner
President and General Manager, The Pfaudler Co., Rochester, N. Y.

As is well known, enamel-lined equipment represents a type of construction which is practically indispensable for many processes in the chemical and allied industries, where non-corrosive and acid-resisting properties are essential. For use in these industries the Pfaudler Co. has developed two different kinds of enamel. One, a brown enamel, is highly acid-resistant and is applied wherever concentrated acids or other very corrosive materials are to be handled. The handling of caustics of any nature is not advocated, although this has been done successfully on occasion. The other enamel, blue-black, applied on most equipment designed to handle weak acids, neutral solutions, etc., meets that general requirement which dictates that the container used in the process shall in no way impart any of its surface material to the product handled.

Pressure Resistance of Enameled Welded Tanks

Recent tests have indicated that enameled steel tanks, aside from their non-corrosive and acid-resisting qualities, have the ability to withstand very high pressures. Thus a Pfaudler tank in a recent pressure-resisting test conducted by the Pressure Vessel Committee at Washington withstood the hammer blow on its jacket up to 1,600 lb. This demonstrates the strength of the welded construction used in this equipment. For details of manufacture, the reader is referred to previous articles.[1]

Another advantage offered by this equipment is that processes requiring very high temperatures may be conducted with minimum amount of danger to the equipment itself. By circulating hot oil in the jacket it is possible to maintain temperatures of 400 to 500 deg. F. without even slightly endangering the enamel lining. For the handling of products with a high degree of viscosity, high boiling point, etc., this feature is extremely valuable. It may be noted that the Columbia Graphophone Co. employs this method for melting beeswax in making records.

There are also many products which are practically non-corrosive but which must be carefully protected against the slightest possibility for contamination. Food products, drugs, fine chemicals and other materials of similar nature fall in this class. The problem of finding suitable containers for processing, handling and storing such delicate products is solved in a most satisfactory manner by the use of enameled equipment. As a typical example, the manufacture of cold cream as conducted by the Palmolive Co. may be cited. The various ingredients are agitated in a Pfaudler mixing tank located on the fourth floor of the plant. When the consistency is fairly uniform, the batch is dropped to a conical enamel-lined tank suspended from the ceiling of the third floor directly below the mixing tank. Here the product is agitated again to complete the emulsification and is then drawn off at the bottom into jars for distribution.

Certain Units Have Been Standardized

Co-ordinated efforts toward standardization have resulted in the development of certain units of general applicability in the chemical industries.[2] These include: A standard jacketed still with reducing ell, which is used for the distillation of essential oils and acids, the reduction of fats, etc.; a standard jacketed closed mixing tank with enameled steel agitator; an open evaporating or crystallizing pan which may be single shell or jacketed as required; a standard utility pot which may be used for a variety of chemical operations. In addition special equipment covering a wide range of designs and applications is manufactured.

[1] See Chester H. Jones, "Enameled Steel Manufacture," *Chem. & Met.*, vol. 25, p. 883, Sept. 9, 1921; Chester H. Jones, "Enamel-Lined Apparatus," *Chem. & Met.*, vol. 25, p. 927, Nov. 16, 1921.

[2] See Emerson P. Poste, "Standardization of Enameled Apparatus for Chemical Purposes," *Chem. & Met.*, vol. 27, p. 1,016, Nov. 22, 1922.

Lead Pigments: Protective Materials for the Chemical Engineering Industries

Chemical Engineers Should Become Better Acquainted With Advantages and Limitations of Paint and Pigments

By J. H. Calbeck
Director of Research, Eagle-Picher Lead Co., Joplin, Mo.

The chemical engineer, unless engaged in the actual manufacture of some of the many products in which lead is used, has little to do with lead pigments, except in the case of paints and cements, and it is along these lines that this paper will deal. Included among the lead pigments are the following compounds: basic carbonate white lead or corroded white lead, basic sulphate white lead or sublimed white lead, sublimed blue lead, red lead and litharge. Lead chromate and other colors containing lead will not be discussed.

The painting done around an industrial plant falls into approximately six distinct classes, which will be discussed in turn.

1. *General Exterior Work*—The materials used consist usually of corroded white lead, sublimed white lead and sublimed blue lead purchased either in the paste form or in ready mixed paints. When purchased in the paste form, these pigments need to be mixed with proper amounts of linseed oil, drier and turpentine. When purchased as ready mixed paints they are ready to use. Ready mixed paint contains, in addition to the lead pigments, various percent-

ages of zinc oxide and inerts such as china clay and whiting. The advantages of lead pigments for these purposes are generally known and there are very few instances where they are not entirely satisfactory.

2. *Interior Painting and Decorating*—The necessity of well-painted and well-decorated interior in chemical and other industrial buildings has of late been given much attention both from the standpoint of safety and sanitation and from the standpoint of efficiency and economy. In some instances white lead is employed using special flatting vehicles for thinning instead of linseed oil. Yet the most widely favored pigments for this purpose are lithopone and zinc oxide, which are generally employed in mill whites and other interior paints.

3. *Priming New Work*—Both steel and wooden structures should be primed as quickly as possible and should be primed with lead in oil or a good mixed paint if the subsequent coats are to give satisfaction. There is no economy in cheap primers. Sublimed blue lead is exceptionally good for both wood and steel and may be used for the finishing coat if a dark color is desired. Red lead has been used for years as a primer for iron and steel work and is preferred by many engineers.

4. *Protective Coatings for Iron and Steel*—As mentioned above, sublimed blue lead or red lead should be employed for priming iron and steel work subjected to all except the most extreme conditions. These pigments sometimes fail in the neighborhood of acid plants where very high concentration of corrosive fumes are given off. In such cases the engineer should use bituminous, graphite, cement or other especially prepared paints. If the conditions are especially bad, the finishing coats should be of sublimed blue lead or red lead, but usually the finishing coats are of lighter hues. Contractors find it a good plan to make each coat a slightly different shade, enabling an inspector to distinguish the different coats easily.

5. *Special Purposes*—In addition to this there are certain special purpose paints, a large quantity of which are used around industrial plants for painting smokestacks, vats, tanks, roofs and equipment where acids or chemicals are used. Painting of concrete work such as floors, stacks and tanks call for special paints. The lead pigments are not used extensively in these plants. Bituminous, graphite and cement paints are usually employed.

6. *Special Color Work*—There is in addition to the above a large amount of special color work to be done about a modern industrial establishment. The advantages of painting fire plugs, switch boxes and pipes supplying water, gas or oil, different colors warrants the special attention necessary to give each one a characteristic color. Lead is used here in the red and yellow pigments, but these colors are usually obtained as ready prepared paints and this certainly is the most satisfactory way to obtain them.

There is a tendency among some engineers to make these special-purpose paints all-purpose paints rather than go to the additional trouble and expense of buying a paint best suited for the job at hand. This is often a costly mistake. There is no all-purpose paint. Yet many superintendents insist in using a stack or roof paint for every purpose about the plant, such as priming iron and steel work or repainting it, and then wonder why it is necessary to repaint so frequently.

It appears, therefore, that the chemical engineer should become better acquainted with advantages and limitations of each pigment and should teach his men how to use them properly.

Building Receptacles of Vulcanized Fiber

A Material of Widening Industrial Application Not Only for Containers but for Gears, Washers, and Other Mechanical Shapes

By C. C. Bell

Vice-President, American Vulcanized Fibre Co., Wilmington, Del.

ALTHOUGH vulcanized fiber is not exactly a new material to the chemical engineer, it may nevertheless be worth while at the beginning to describe briefly what it is and how it is made. It is a cellulose product, manufactured from pure cotton rag paper treated with zinc chloride. Following a washing process the product goes to the dry house. The chemical action is extremely constrictive, causing the sheets to buckle, and considerable pressure is necessary therefore to flatten them for practical use. This is done in power hydraulic presses, which also function to press the material into the shape in which it is finally sold.

At the time the product was first developed, its only apparent market was in the electrical trade, where the principal insulating material used was vulcanized hard rubber. As a competitive material the new cellulose product gradually became known under the trade name of vulcanized hard rubber, although no vulcanizing process enters into its manufacture.

Its Field of Usefulness

The use of vulcanized fiber for electrical insulation was enormously developed. The high tensile strength of the material and its resistance to wear favorably impressed machine builders, boot and shoe manufacturers and many other industries. With the increasing popularity of the automobile, a new market opened which has since been continually expanding.

Except for the use of fiber gears, washers, bushings and other mechanical shapes, the chemical engineer is perhaps most interested in the adaptability of vulcanized fiber for the manufacture of receptacles and containers. In many industries in which chemical technology forms a vital part, fiber cans, boxes and trucks are used successfully in the place of metal or wood, even though the initial cost is materially higher.

The use in the rubber industry is an example of specialized application. Here vulcanized fiber has been introduced in the form of compound pans and barrels, although factory cars are also made of it occasionally. The hard usage to which compound pans are subjected makes imperative the use of a material presenting an enormous resistance to wear. The light weight of vulcanized fiber is in its favor, but one of the most important of its advantages is the fact that vulcanized fiber will not splinter, consequently there can be no chips or small material to fall into the contents of the pan. It is fair to assume that this same property will result in a more general use of these receptacles in other of the chemical and allied industries.

Chemical Stoneware and Its Applications

Being Hand-Molded, Special Shapes Are as Available as Stock Designs for Use Wherever Corrosive Action Is Encountered

By Maurice A. Knight
Maurice A. Knight, East Akron, Ohio

While chemical stoneware is a ceramic material made from clay, its composition is very different from that of ordinary stoneware, pottery, tile or brick, since it will withstand the action of acids, alkalis and corrosive chemicals. In addition it must have mechanical and thermal properties that will enable it to withstand considerable shock and reasonable changes in temperature. For the acid-resisting quality the ware as manufactured in the writer's plant does not rely on any glaze, enamel or veneer, but the entire body has this property. A salt glaze is applied for looks and finish, but plays no part in the acid-proof qualities.

When chemical stoneware was first brought on the market the sizes and designs were very limited, but as experience taught the manufacturers more and more about the compounding and nature of the clays used, the drying and firing, more varied and larger sizes and designs were evolved, until today nearly anything mechanically possible can be made in chemical stoneware.

Although the properties involved in the manufacture of chemical stoneware have been covered in detail in a previous article,[1] a brief review may not be out of place here. The raw clays which come from various parts of the United States and from foreign countries are first prepared through the use of special machinery so that they are of the right consistency and fineness for use. They are then washed, screened and filterpressed, after which they go to the blending room, where they are mixed in the proper proportions to form the different bodies. Seven different bodies are used for chemical stoneware, each designed for a particular service with due regard to the type of corrosion which will be encountered by the finished apparatus. After thorough aging, the prepared clay is ready to be molded by hand into the desired shapes. Then the ware must be carefully and evenly dried in a mechanical drier in a hot room or by natural drying in an open room, depending on the size, design and application of the piece. This drying is a very critical operation and one that must be thoroughly understood if the ware is to come through the fire in first-class shape. When thoroughly dry the ware is fired in periodic down-draft kilns, the firing and cooling operation requiring 2 weeks. The apparatus is then drawn from the kiln, inspected, checked for measurements, tested, packed and shipped. On the average, making a piece of chemical stoneware requires from 4 to 8 weeks from the start to the packing room, depending on size, thickness, design, etc., and this time cannot be shortened without danger of losing the piece.

Hand Work Facilitates Production of Special Designs

Experience has shown that the only practical way to make good reliable chemical stoneware involves hand work by skilled workmen, who must be able to read and interpret the most intricate blueprints. This phase of the industry should be of greatest interest to the manufacturer of chemical products, as on this account he is not limited to standard designs for his process, but can have the apparatus made up to suit the requirements of each reaction. Furthermore, making apparatus to the customer's blueprints or designs is not, as many suppose, a costly procedure, but is in fact comparatively no more expensive than were they stock designs, for even stock designs in chemical stoneware are not made by machinery but by hand, as has already been indicated.

As chemical stoneware is made in the form of various designs of pipe and fittings in a wide range of diameters, in kettle designs, tanks, jars, tourills, receivers, storage jars, tower sections, distributors, tower packing, ejectors, blow cases, monkey pumps, faucets, manifolds, carboy stoppers, acid steam jets, brick, tile linings for tanks and towers, perforated filter tile and filters, generators, subliming pans, decanting jars, evaporating dishes, laboratory sinks, coils of many sizes and designs, "S" pipe, return bends, vapor pipe dampers, dipping baskets, pitcher and jugs, funnels, etc., there is hardly an industry that employs acids, alkalis or corrosive chemicals in its processes that has not some use for chemical stoneware, so it can be briefly stated that chemical stoneware is used and can be used in every industry where there is corrosive action of any kind.

[1] Chester H. Jones, "Chemical Stoneware Manufacture," *Chem. & Met.*, vol. 25, p. 289, Aug. 17, 1921.

Glass in Chemical Industry

A Material Which Is Having an Increasingly Wide Use in Chemical Industry—Its Interesting Development

By J. F. Greene
The Kimble Glass Co.

Glass as a material for industrial construction has been known and used for some time. Recently, however, it has seen new application in the use of low-expansion glass for the fabrication of pieces much larger and heavier than any previously attempted. The properties of glass which make it a desirable element in industrial chemical engineering practice are: (1) its transparency, (2) its possible perfection of finish, making a "glassy finish" a byword for supreme smoothness, (3) resistance to chemical attack, (4) the facility with which it can be blown, drawn, pressed or cast. All these properties are not inherent to the highest degree in all glasses, and usually a glass which rates high in one desirable quality will be less suitable in another respect.

The disadvantages of glass are likewise more apparent in some types than in others. They are: (1) brittleness and (2) low tensile strength in the piece, due to the enormous influence of scratches and cracks. Two other properties that come in question are resistance to heat shock and ease of annealing. Glasses vary widely in the possession of these qualifications.

Having in mind the necessary properties of the material which is to compose any industrial piece, the chemical engineer will arrive at a reasonable decision by considering how well any commercial glass meets

his specification and how its total cost (first cost and maintenance) will compare with that of any other material from which the piece might be fabricated. It will sometimes be found that a very expensive material will be cheapest in the end, due to low maintenance costs and fewer interruptions to production. In other cases the cheapest possible material will be the only one really economical.

In application where transparency is the determining factor, glass is almost without a rival. Such applications are sight feed glasses, high-pressure gage glasses, glass plates for peep holes, etc. Sight feed glasses, gage glasses, etc., are usually connected to a metal fitting. In selecting a glass for this service, accuracy of sizing should be considered, since a good fit is essential. The glass should be selected to meet the temperature, pressure and heat shock requirements of the particular use. The more trying these are the more expensive glass must be used.

For resistance to chemical attack, glass is excelled in some instances by tin and platinum. It is superior to them in its resistance to phosphides, sulphides and the halogens. Earthenware has the disadvantage of porosity, and chemical stoneware improves in resistance as it approaches a glass in composition. No glass offers complete resistance to strong alkalis. However, much glass is used as small parts of electrolytic caustic plant, because the attack that takes place does not harmfully contaminate the caustic and the pieces can easily be replaced. Thus are used brine wells, a molded tube 3x19 in. with a ¾-in. hole drilled in the bottom and caustic tubes, eccentrically shaped tubes about 12 mm. in diameter. The manufacture of these small parts in any other material than glass would be more expensive and not so satisfactory in use.

The Newer Uses of Glass

At a recent application of glass as a resistant material was described by F. C. Zeisberg in a late number of *Chem. & Met.* Small glass rings were used as a tower packing. It is possible to make glass rings very much smaller than earthenware or stoneware rings and as a result obtain a packing material with an enormously increased surface in a given volume. The use of glass pipes, known as "powder tubes," for pipe lines in the powder industry is an application of long standing. The well-known Hart condenser, with tubes 3 in. in diameter and 6 ft. long, is still another application.

Its ease of fabrication makes glass a desirable material for many applications where transparency and resistance are not especially necessary. Jets and nozzles of various types and sizes are readily made of glass. The fire-polished finish gives a nozzle which offers the minimum resistance to flow, and allows a perfectly untroubled stream to issue. Such jets are usually made from glass tubing by reworking at the lamps, although larger sizes could be blown in a mold.

There are numerous small parts and fittings in use in the chemical industries which could be made of molded or pressed glass, doing away with expensive alloy metals and machine work. The glass piece would besides be of good resistance to chemical attack and could be fabricated from a glass having the necessary strength and resistance to heat shock.

Before settling on the final design of parts which could be made of glass, it is well to inform the manufacturer of the service under which the material is expected to stand up. He may be able to suggest minor changes in design which will greatly increase ease of manufacture. A serious consideration of industrial glass shapes and products will well repay the designing engineer.

Industrial Pyrex

The Material Is Discussed From the Standpoint of Desirable Basic Characteristics and the Methods of Fabrication

By A. E. Marshall
Consulting Engineer, Baltimore, Md.

THE interest displayed by chemical engineers and manufacturers in the adaptation of Pyrex glass to plant uses has resulted in a continuous progression of development work and has also provided an indication of the demands of the chemical industry for materials with acid- and heat-resisting properties.

In a previous article published in *Chem. & Met.* an outline was given of the initial stages of applying a material, familiar in laboratory shapes and sizes, to actual plant-scale operations. The present article is a summary of more recent developments and the reasons which lend interest to the future possibilities of Pyrex in the industrial field.

A general consideration of the essential requirements for plant construction materials indicates the following as desirable qualities:

Basic Requirements

1. Resistance to chemical corrosion over a wide range of temperatures.
2. Resistance to heat and to changes of temperature.
3. A reasonable degree of mechanical strength.
4. Possibility of production in a variety of shapes.
5. A cost which makes the complete plant unit a commercial possibility.

No single manufactured product completely meets all of these requirements, although nature has provided certain precious metals which possess ideal characteristics. In the case of precious metals, however, the quantities available and high cost largely remove them from consideration as industrial possibilities. Plant materials have therefore to be selected with due regard to a balancing of useful properties against known limitations.

A survey of the chemical and physical characteristics of Pyrex indicates many desirable factors coupled with certain present limitations in size which somewhat restrict its field of application or call for the development of new types of construction based on available shapes. Some of

Fig. 1—Inspector examining a 24-in. diameter Pyrex dish by means of a polarized light.

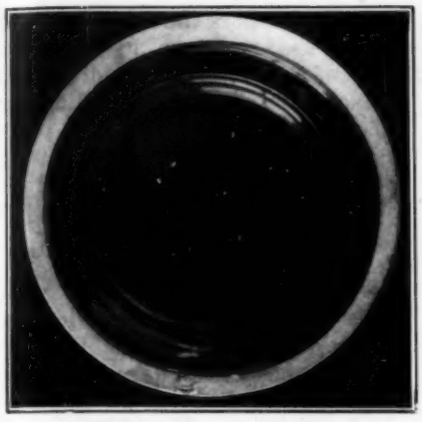


Fig. 2—End view of a 6-in. Pyrex socket pipe showing uniformity of wall of socket portion.

the basic engineering data for Pyrex glassware follow:

Specific gravity	2.25
Specific heat	0.20
Elasticity coefficient	6230 kg. per sq. mm.
Linear expansion coefficient (19°-350° C.)	0.0000032 per deg. C.
Thermal conductivity	0.0027
Electrical resistivity. (surface)	10^{14} ohms at 34 per cent humidity

Mineral acids, with the exception of hydrofluoric and phosphoric, have no appreciable action up to their respective boiling points.

Limitation on Size Varies With Method of Fabrication

The limitations of size which have been referred to are of importance to the engineer, as lack of this information may call for substantial changes in design. An appreciation of the present limits can best be secured through a consideration of the various processes employed in fabricating industrial Pyrex. The principal methods of production are: Pressing, blowing and working by lamp.

The maximum size of a pressed article is a factor of weight of glass and nature of shape. Simple shapes such as hemispherical dishes can be made 24 in. in diameter, 30 liters capacity; such a dish shown in Fig. 1. More complex shapes have smaller limits, centrifugal pump liners, for instance, being a possibility up to 15 in. maximum diameter. Pressed shapes are desirable whenever fairly accurate external dimensions are desired, although it should be realized that the precision of a machined metal product cannot be obtained in Pyrex except with an extremely high rejection factor.

The second process, blowing, is restricted, in the case of industrial Pyrex, to blowing into molds. This gives a useful degree of external surface accuracy and also permits manufacture with wall thicknesses adapted to the intended use. Condenser parts made in molds can be held to ⅛ to ¼ in. walls and high cooling efficiencies secured in the complete condensing apparatus. Conversely, socket pipes can be made with heavy walls to withstand the abuse of careless handling and mechanical shocks. Fig. 2 is a photograph of a 6-in. socket pipe viewed from above the socket. It illustrates a desirable thickness for the socket portion and also shows the uniformity of wall. Present sizes of mold-blown ware range from 72 liters capacity for flask or retort shapes to 12-in. diameter for socket pipes and cylinders.

The third process, working in the lamp, is an extension of glass-blowing practice to the manufacture of complex shapes incapable of production by pressing or blowing. T's, L's and other fittings are made by lamp working and have a present limit of 3-in. bore. Lamp work is also resorted to in the attachment of side connection, spigots, etc., to articles produced by the mold-blown process.

All three processes are being gradually developed toward the production of larger sizes, and an evidence of this progress is best supplied by a comparison of material available 6 months ago and at the present time. The final limits of size will of course be set by structural consideration, but these limits are a long way beyond any of the available methods of manufacture.

FIG. 3—TYPICAL PYREX SOCKET PIPE

Uses of Industrial Pyrex

Industrial uses of Pyrex can be grouped under specific applications of properties, as this method affords a useful guide to the consideration of new apparatus not included in the list. Four classifications have been followed in preparing the summary, although it will be recognized that in some cases several factors are concerned in the one piece of equipment.

1. Uses where acid resistance is important: Acid distillation sets, Hart nitric acid condenser tubes, "S" bend nitric acid condenser, hydrochloric acid coolers, pipe lines for acid gases and liquids, small tanks and pots.

2. Uses where resistance to heat shock is desirable: Condensers for organic liquids, parts for tubular evaporators, receivers for hot condensates, etc., pans and trays for driers.

3. Uses where purity of product is essential: Evaporating and crystallizing dishes, pipe lines for liquid food products, drying trays for biologicals, alkaloids, etc., tanks for precious metals solutions, reels for silk dyeing machines.

4. Uses involving transparency: Sight glasses for stills, etc., gage tubes for boilers, tanks, etc., tail boxes for distilling columns, sight pipe sections for chamber plants, apparatus for photochemical synthesis.

The majority of the applications given above relate to complete pieces of equipment, so in these cases special features of construction are not involved. The user of industrial Pyrex should remember, however, that while the material has a remarkably low coefficient of expansion, it should not be heated by a direct flame. Suitable provision in the design of the heating arrangement to obviate direct flame contact does not imply any appreciable loss in utilization of heat units.

Pyrex pipe lines, whether of the flanged or socket type, call for modification of usual methods of construction. Flanged pipes are not bolted together direct, but use is made of an extra pair of loose flanges (aluminum, cast iron or pressed steel) and external rubber gaskets between the metal flanges and the pipe. The surfaces of the Pyrex pipe flanges are ground true and suitable gaskets inserted.

Socket pipes should not be cemented with hard setting socket fillers, but a cement employed which will give the desired resistance to the acid gas or liquid with retention of plasticity. An asbestos rope ring

forced into the bottom of the socket space has been found often to be a desirable feature of this form of construction.

Development work on a number of new industrial applications of Pyrex is being actively carried on, and it is confidently expected that Pyrex will soon pass from the "new material" stage and become one of the accepted standard materials for chemical plant construction.

Vitreosil in Acid Manufacture

Greater Facility of Manufacture Has Permitted a Wide Extension of the Use of Fused Silica in Industry

By S. L. Tyler
Thermal Syndicate, Ltd.

THE early manufacture of fused quartz was carried on by the blowpipe method, the oxyhydrogen flame used as the source of the heat for fusing rock crystal. Later developments made possible the use of electrical energy as the source of heat and with this the possibility of producing much larger pieces and a greater range of shapes than had even been practical before.

Pure fused silica has a melting point at about 1,750 deg. C. It softens slightly at 1,400 deg. C. but does not reach the truly fluid condition until temperatures well above 2,000 deg. C. are reached and at these temperatures only under increased pressure. At a temperature of about 1,100 deg. C. there is a reversion back from the vitreous state to the crystalline state, but this change is very slow. At higher temperatures the devitrification is more rapid, but at no point does it occur suddenly. The coefficient of expansion of fused quartz is 0.00000054 per deg. C. over the range of 0 to 1,000 deg. C., this being the lowest coefficient of expansion of any material known over a similar range.

High Corrosion Resistance

It is not affected in any way by any of the mineral acids with the exception of hydrofluoric acid and phosphoric acid at high temperatures. It can be used in the handling of solutions or the making of fusions where conditions are acid or neutral. Alkaline solutions or fusions react directly with vitreosil. Ammonia is the exception to the foregoing.

Because of its high acid-resistant nature fused silica has been extensively used in the concentration of sulphuric acid, the cooling and concentration of nitric, in the cooling and absorption of hydrochloric and also in the concentration of phosphoric acid and other corrosive liquids such as zinc chloride.

The sulphuric acid concentration units are of the cascade type composed of a number of basins with long spout set in cascade over the fire flue. The weak acid is fed in at the upper end of the cascade and flows by gravity to the lower and hotter portion with a continuous increase in concentration of the acid. In this type of plant the fire gases are kept entirely out of contact with the acid itself and the silica does not introduce any impurities into the acid, so the concentrated acid obtained contains no added impurities. The cascade type of concentrator is generally limited to the production of sulphric acid 66 deg. Bé.

In the cooling and condensation of nitric acid vapors the S bend type of plant is used and from these units an acid of very good quality and strength are obtained. No difficulty whatever is experienced in the packing of the joints, and by operating the condenser on the reflux principle the majority of the acid obtained is water white.

The Silica Absorption Vessel

The cooling of hydrochloric acid gas, whether obtained by the salt sulphuric acid or the combustion method, is carried out in S bends which are thoroughly water cooled and the absorption is carried out in a new absorption unit which has already been described. (*Chem. & Met.*, Aug. 2, 1922, vol. 27, No. 5.)

Fused silica, because of its low coefficient of expansion and good heat transfer, is especially well adapted to the cooling of corrosive gases. It is compact in design and light in weight, which tends toward reducing erection costs considerably. Indications are that the field for this material will be bigger and more extensive in the future because the greater facility in fabrication has permitted the manufacture of numerous shapes.

Fused Silica in Radium Production

Replacing Expensive Porcelain Ware, This Material Has Established Its Industrial Utility—Some Hints About Its Use

By Charles H. Viol
Director, Vanadium Co. of America

AT the outbreak of the war in 1914, we were using in our refining operations, which involved the fractional crystallization of thousands of pounds of radium barium chloride per year, the best porcelain which the market afforded, this being the Royal Berlin porcelain. The war soon ended our ability to secure these porcelain dishes and we hit upon the use of the larger sized vitreosil fused silica dishes. At that time the dishes were not as large as we would like nor were they provided with an altogether satisfactory lip, but in all other respects they were eminently satisfactory, and in their durability they were superior to porcelain. Later we were able to secure the larger dishes with the good pouring lip as manufactured for the sulphuric acid concentration work, and this form of dish has given us the greatest satisfaction, fulfilling every requirement that could reasonably be asked in ware of this class.

Enameled metal would probably be more durable, but an investigation of this ware convinced us that the cost was prohibitively high for our particular use and while, from the standpoint of mechanical strength, it might be more durable than the silica, it is problematical whether such ware would withstand, as well as does the silica, the fumes and acid liquors which would come in contact with it.

Wooden Stirrers Diminish Breakage

We have had breakage with this ware from time to time, a large part of which was traceable to the use of heavy glass stirring rods, which have since been replaced by wood. With this change we have been able to heat the dishes directly over a gas flame, supporting the dish by contact with a metal plate provided with a circular opening, and this rather rough treatment of the ware more than anything else goes to show the sturdy quality of the fused silica.

The Week in
Industry and Trade
Current News and Market Developments

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April 16, 1923

CHEMICAL & METALLURGICAL ENGINEERING

Tenth Avenue at 36th Street, New York

H. C. PARMELEE, *Editor*

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The Summary of the Week

The weighted index of chemical prices showed a moderate reduction for the first time in weeks, reflecting, to a large extent, an easier situation in fertilizer materials.

Phenol on spot, resale parcels, sold at 53@55c. per lb., which compares with 26c. per lb. the contract price at which producers are making deliveries.

Firmer prices were named in some directions for citric acid, spot and shipment.

Cables from Europe reported a higher market for tartaric acid and cream of tartar.

Shipment prices on German chemicals are unsettled, with doubt about deliveries.

Consumers of cresylic acid appoint committee to petition Tariff Commission for reduction in tariff duty on this material.

Trial examiner of Federal Trade Commission recommends dismissal of complaint against the Procter & Gamble Distributing Co., charged with selling its goods with a guarantee against price reduction.

Estimates on supplies of calcium arsenate show increase over earlier figures, but still indicate a shortage.

Caustic potash and potash first sorts sold at higher prices in the spot market.

Consolidations of large manufacturing companies reported, with others in prospect.

Prices for linseed oil were advanced 3c. per gallon on the scarcity of spot stocks.

Federal Trade Commission announces that its investigation into arsenic and calcium arsenate situation fails to disclose any concerted effort of producers to manipulate prices.

Uniform Sales Contract for Heavy Chemicals

AS reported last week in the news columns of *Chem. & Met.*, the Salesmen's Association of the American Chemical Industry has taken up the question of adopting a uniform contract to be used in transactions involving heavy chemicals. Through a committee, consisting of men prominent in the industry, the association already is engaged in the preliminary work of drawing up the provisions of a suitable contract. The committee will welcome suggestions and constructive advice with the sole purpose in view of producing a document that will meet with the approval of the trade and will operate efficiently.

The advantages of such a contract are apparent. To begin with, there is no good reason why a standard contract for heavy chemicals should not be adopted and put into operation. There are many reasons—reasons making for economy, efficiency, simplicity and avoidance of possible misunderstandings—why a uniform contract should supersede the individual and sometimes widely varying contracts now in force.

Trading in imported vegetable oils is regulated by a contract that has been universally adopted by importers and dealers in these oils. There are two features to this contract to which we would direct the attention of the committee now engaged in working out a contract for the heavy chemical trade.

In the first place, it was sponsored by the New York Produce Exchange and functions under the sanction and protection of that institution. Buyers and sellers alike have implicit confidence in a contract wherein terms and conditions have been standardized and where the contract is labeled with the official approval of a recognized organization. The proposed chemical contract will be similar in this respect—that it will be representative of an organization of acknowledged standing in its own field.

This leads up to the second feature to which we have referred, consisting in a clause in the vegetable oil contract wherein it is provided that any disputes arising out of the contract shall be submitted to arbitration in accordance with the rules of the Produce Exchange. These oil contracts can carry an arbitration clause because there is an organization ready and equipped to handle the arbitration. A contract espoused by the Chemical Salesmen's Association likewise can carry an arbitration clause with arbitrations conducted under the auspices of the association.

The advantages of arbitrating commercial disputes may be briefly summed up in the words of the past president of the National Association of Credit Men in session last week:

"Aside from the settlement of disputes in commercial transactions, the arbitration plan could comprehend disputes over contracts in allied fields. Why should the dockets of courts be congested? Why should delays be suffered in the adjudication of contentions when arbitration would insure justice and with very considerable saving in time and cost?"

We respectfully commend the arbitration clause as an integral part of the contract for heavy chemicals.

Technical Societies and Trade Associations

News of the Week

Current Events Legislative Progress

Government Investigations Establish Validity of Calcium Arsenate Prices

Federal Trade Commission Reports Production Inadequate for Demand—Supply Larger Than Had Been Expected

TWO separate investigations by the government have failed to disclose any evidence of concerted action by manufacturers of calcium arsenate to fix prices. One inquiry, by the United States Department of Agriculture and the Geological Survey in response to a Senate resolution, found that uncertainty of the demand was responsible for the present shortage of the insecticide, resulting in price variations that were not brought about by price fixing. In a preliminary report just made public, the Federal Trade Commission, which also investigated the calcium arsenate industry, confirms these findings.

No Unfair Practices

"No widespread or important specific cases of unfair practices in the trade," says the commission in summing up its report, "have been found down to the present stage of the inquiry."

The commission concludes:

"The great increase in the Southern demand for calcium arsenate and the inadequacy of the available supply of white arsenic prevented the insecticide manufacturers from producing sufficient quantities of calcium arsenate to meet this demand, the result being a marked increase in the price of white arsenic and of calcium arsenate during the seasons of 1922 and 1923.

"The low price paid in the State of Georgia during the term of the Sherwin-Williams contract with that state was, in part at least, responsible for the opinion that an injustice was being done by the insecticide manufacturers to those customers outside the state who were paying a price as high in some cases as 100 per cent greater than that named in the above-mentioned contract, an opinion which was shared by the Georgia consumers after the expiration of this contract, when they likewise had to pay similarly high prices for calcium arsenate.

No Evidence of Price Fixing

"While efforts were made by the insecticide manufacturers to establish an association, one of the objects of which seems to have been the adjusting or at least discussion of price discrepancies, it does not appear that these efforts resulted in price-fixing or open-price activities."

The investigation by the commission was made in response to a Senate resolution. Demands for an inquiry were based upon wide variations in the price of calcium arsenate. Prices, which in October, 1922, ranged from 10 to 12 cents a pound, increased rapidly during the next 30 to 60 days, and in February, 1923, had reached a range of 18 to 19 cents.

Increased Supply in Sight

In connection with the supply of calcium arsenate B. R. Coad of the Bureau of Entomology estimates that twenty-five million pounds will have been made available by June. This is practically double the amount of the estimate made last October. "This great increase has not been brought about," says Mr. Coad, "by any sudden discovery of a large quantity of material, but merely by accelerated production throughout the raw arsenic-producing industry, together with readjustments in programs throughout the arsenic-consuming industry, resulting in more arsenic being used for calcium arsenate production than was anticipated at first."

Demand Has Fallen Off

Continuing, Mr. Coad says: "About the first of February a survey of the situation showed that apparently around eighteen or nineteen million pounds had already been contracted for delivery by the manufacturers, and the margin thus left for sale was comparatively small. Since that time, however, there has been a decided lull in buying, and a considerable amount of cancellation of these contracts by jobbers and others, who had bought without any very definite idea of the amount they would be able to distribute. As a consequence, for at least the past few weeks the manufacturers have for the first time been confronted with the possibility of production of material for which there is no immediate demand, and if this situation continues very long, we must expect some curtailment of calcium arsenate production programs.

Shortage Is Predicted

"Every year so far, since calcium arsenate has been used for cotton dusting, we have seen a very heavy last-minute demand during the months of May and June, and particularly during 1922 this demand was so exceedingly heavy that it was impossible to produce material to meet it. As the situation stands today, there are probably several million pounds of material which will be available for this late demand, if present manufacturing programs are carried out, but, as has been pointed out, this production will be reduced somewhat if the demand continues to fall off.

"Furthermore the prices at which the arsenic has been purchased are such that the manufacturers cannot afford to turn it into calcium arsenate to sell at a price very much below the present levels, and thus they will take no chance on overproduction. At the same time, however, if we may judge at all by past experience, the late demand will be far in excess of the margin available for its satisfaction. In other words, as nearly as can be foretold at this time, even with continued maximum production of calcium arsenate and at prices now prevailing, there will be a definite shortage of calcium arsenate by the time dusting becomes active, and probably somewhat earlier, but this shortage will not be nearly as acute as was anticipated in the early fall."

Chemical Salesmen to Meet Wednesday

The April meeting of the Salesmen's Association of the American Chemical Industry will be held Wednesday evening, April 18, at the Chemists' Club, 52 East 41st St., New York City. Dinner will be served at 6.30 p.m. sharp, but members and their friends are urged to be on hand early for the purpose of getting acquainted. H. B. Prior, chairman of the entertainment committee, has arranged an interesting program for the occasion. The principal speaker will be Paul T. Cherington of the J. Walter Thompson Company, one of the leading firms in the advertising field.

Mr. Cherington was formerly professor of marketing in the Graduate School of Business Administration of Harvard University and later was secretary-treasurer of the National Association of Wool Manufacturers. He has had a wide range of experience on the general subject of merchandising and advertising and has earned a reputation as an able writer and a clear speaker. He will speak on the subject: "Problems Experienced in Marketing a Consumer Product." The speaker will be introduced by Charles Wadsworth, 3rd, assistant editor of *Chem. & Met.*, who will also outline a program which has been suggested with the idea of making these meetings more interesting and beneficial.

Washington News

German Chemical Exports Are Restricted

Chance for American Manufacturers to Supply Foreign Markets

The volume in which German chemical exports continue to move is occasioning some surprise, but reports reaching Washington indicate that these exports are confined largely to the United States and to Great Britian, countries in which Germany is particularly anxious to build up credit and to retain markets. Reports from Austria, Germany's next-door neighbor, which has relied on Germany since the war for its entire chemical requirements, indicate that the country is in desperate straits as a result of the practical cessation of chemical supplies from Germany. The situation is one which is expected to force the Austrian chemical plants to reopen. Since the war the financial situation in that country has been such as to discourage any resumption of manufacturing activities.

U. S. and England Favored

The reports from Austria and from other countries indicate that Germany is exporting almost exclusively to the United States and to Great Britain. It is believed, however, that the rate of exportation will diminish sharply from this time forward. An indication of the situation in Germany is had in the fact that inquiries looking to the purchase of chemicals are being received in this country from Germany. Another indication is the increasing shortage of German patented products.

Opportunity for America

Information reaching Washington indicates that chemical manufacturers in this country, engaged as they are in an effort to supply a very active domestic market, are paying very little attention to the opportunities now offered to annex foreign markets. In that connection it is pointed out that such an apportunity rarely knocks twice in a generation. During the war the American chemical industry had an opportunity to annex permanently certain of the foreign markets that had been supplied theretofore by Germany. This opportunity was not improved to any great extent, but at that time the industry had had little experience in foreign merchandising and there were difficulties as to quality and uniformity, which now have been overcome. The opinion is expressed that if the industry does not improve this second opportunity in the scramble to take full advantage of the peak to which the wave of prosperity has pushed domestic demand it would be well now to enter upon manufacturing expansion without losing sight of the volume of domestic business in the off-peak period.

Recommends Dismissal of Price Maintenance Suit

Final arguments were heard on Wednesday before the Federal Trade Commission on its complaint against the Procter & Gamble Distributing Co. of Cincinnati, which was charged with giving rebates to jobbers and with selling its products with a guarantee against price declines. Warren R. Choate of the Federal Trade Commission recommended that the complaint be dismissed.

Although the examiner suggested that an order be issued dismissing the complaint, the commissioners listened to exhaustive arguments by both sides.

In recommending dismissal of the case Mr. Choate stated that the practice of guaranteeing jobbers against price declines and of giving rebates on credit allowances had existed in the soap industry for 30 or 40 years and that the Procter & Gamble Co. had not taken advantage of competitors who did not give price decline guarantees. As used by the respondent, it was declared that the practice did not deter manufacturers from reducing prices, and did not encourage speculation by jobbers.

American Phosphate Rock Shut Out of the Ruhr

Shipments of American phospate rock are not being permitted to enter the occupied portion of Germany, protests to Washington indicate. Representatives of this government in Germany have been asked to ascertain whether this is deliberate action on the part of German authorities or is being occasioned by transportation embargoes incident to the disturbed situation.

Invoices of Coal-Tar Imports Must Show Makers' Name

In compliance with the new tariff act, the Treasury Department has requested the State Department to notify consuls to require additional information with invoices of coal-tar dyes and chemicals.

A proviso of the coal-tar paragraph stipulates that 6 months after passage of the act each invoice and container shall state the name of the manufacturer, the trade name of the article, the chemical formula with the trade name or identification number, if the article is not classified and identified chemically in the Schultz or some other similar publication, the Schultz or other number if any, or if none, the class or color—that is, whether it is an alizarine, azo or sulphur color, etc.; the percentage exclusive of diluents of the pure dye contained in the article, and that these particulars shall also be stated in the case of each dye contained in a mixture of two or more dyes.

Alsatian Output of Potash Increased in 1922

During 1922 the potash mines in Alsace exceeded the production of any previous year. In 1922 the total output was 1,326,727 tons. In 1920 the Alsatian production was 1,222,370 tons. This greatly exceeded, however, the 1919 production, which was 592,365 tons. The 1921 production was 903,134 tons.

Potassium chloride is being produced at the rate of 250,000 tons, which is the maximum which can be produced with the existing plants. In addition to the chloride production, however, there is a very material production of potassium sulphate.

"Tarpentine" Is Unfair Name for Turpentine Substitute

Advertising a product so as to give the impression that it is turpentine when such product is a coal-tar distillate and not obtained from the sap of the pine tree is declared by the Federal Trade Commission to be an unfair business practice. The commission in its investigation of the International Paint & Oil Co., of Peoria, Ill., developed the fact that the concern used the name "Tar-Pentine" in marketing a commodity resembling turpentine and made various claims of the superiority of its product over turpentine. The commission's order specifies that respondent must stop using the words "Tar-Pentine," "Tarpentine" or words of similar import, in connection with the sale or offer for sale of a commodity which is not turpentine.

Production of Methanol Declined in February

Acetate of Lime Output for That Month Also Lower

The production of acetate of lime and of methanol declined still further in February from the high mark set in December. Acetate of lime output amounted to 13,894,000 lb., as against 16,544,000 lb. in January, and methanol production was 773,179 gal., as against 933,171 gal. in December. Consumption of wood declined to 85,105 cords and stocks of wood at chemical plants declined to 807,782 cords, the lowest since November, 1921.

The following table shows total comparative figures for the past 5 months, as reported by firms with a daily capacity of 4,500 cords (or prorated to that capacity in months where some reports were lacking), and the comparable monthly figures for 1922, taken from the *Survey of Current Business* published by the Department of Commerce:

1922	Acetate of Lime Thous. of Lb.	Methanol Gal.
October	12,217	664,933
November	15,440	835,687
December	16,814	942,008
1923		
January	16,544	933,171
February	13,894	773,179

Mergers of Manufacturing Companies Completed and in Prospect

Certain-Teed Products Corporation Absorbs Linoleum and Cement Companies—Cotton Oil and Linseed Oil Companies Figure in Merger Rumors

GEORGE BROWN, president of the Certain-Teed Products Corporation, which is one of the largest manufacturers of paints and roofing materials in this country, has confirmed earlier announcements to the effect that the company had acquired control of Cooks Linoleum Co., Trenton, N. J., the Acme Cement Co., St. Louis, and Thomas Potter & Sons Co., manufacturer of linoleum at Philadelphia. In confirming the merger of interests Mr. Brown stated:

"These large additions to our present manufacturing facilities and administrative organizations means the completion of our line of products for the construction, protection and equipment of buildings and the distribution of these closely related necessities through the same channels, eliminating all avoidable waste."

The amount involved in completing the merger of these companies was $8,000,000. The consolidation brings under one producing and administrative organization the leading linoleum manufacturers of the United States and also puts the corporation in the fore rank of gypsum producers. The Certain-Teed Products Corporation has shown remarkable growth in the last sixteen years.

Another Merger Rumored

Following the confirmation of this consolidation of interests rumors were heard that a merger of the American Cotton Oil Co., the Portsmouth Cotton Oil Refining Co. and the Gulf & Valley Cotton Oil Co. has progressed to a point where definite terms of consolidation had been agreed on. According to reports the consolidation would require $10,000,000 new capital, which would be used chiefly in retiring outstanding notes of the American Cotton Oil Co. and for working capital. A syndicate was said to have charge of underwriting this stock issue.

The report further stated that no name had yet been selected for the new company and that the stock distribution had not been worked out, but in the case of the American Cotton Oil Co., which has a common stock capital of nearly $21,000,000, it was stated this would be scaled down to about one-third and that holders of this stock would be asked to accept one share of stock in the new company for each three shares of American Cotton Oil stock.

Royal Victor, counsel for the American Cotton Oil Co. and one of its directors, issued a statement denying the accuracy of the reported merger. He stated that: "If any plan of consolidation or merger with other interests is effected, the management will give authentic information concerning it."

The American Linseed Co. and the Midland Linseed Products Co., leading producers of linseed oil, were most prominently connected with still another reported merger. The latter reports apparently originated in financial circles and could not be pinned down to anything definite. The rumor was that the American Linseed Co. would absorb one of its competitors and apparently the Midland Linseed Products Co. entered into the report because of its prominence in the industry.

To Apply for Lower Tariff on Cresylic Acid

More than twenty representatives of consumers, producers and importers of cresylic acid met at the Old Colony Club, New York, on April 9, to discuss the tariff situation, and it was agreed to ask for a lower rate under the flexible rate clause of the tariff. Unless a lower rate is granted, many consumers will be forced to abandon using this important coal-tar product, according to members of the trade. The tariff provides for a rate of 55 per cent ad valorem plus a specific duty of 7c. a pound. Domestic production has been below requirements. Under the tariff cresylic acid cannot be imported under $1.30 per gallon, while producers here are delivering this material against existing contracts at approximately 79c. per gallon. Consumers not protected by contract are at a great disadvantage.

The following were appointed at the meeting to present the matter before the United States Tariff Commission: M. M. Marcus, West Disinfecting Co.; W. E. Jordan, Jordan Coal-Tar Products Co.; W. H. Gesell, Lehn & Fink; P. C. Lemley, William Cooper & Nephews; R. N. Chipman, Chipman Chemical Engineering Co.

Austrian Company to Produce Calcium Nitrate

A message from Munich states that the Stickstoff A. G., which belongs to the Bayerische Stickstoffwerken A. G. of Munich and is an Austrian company working with German capital, is about to construct important works for the production of calcium nitrate at Gollingen. The company will utilize chalk from the neighboring quarries, native peat coke and nitrogen from liquid air, and will obtain electric power from hydraulic forces which can be utilized in the region. The construction at a later period is also contemplated of electric works on the Kapruner-Ache.

Trade Brevities

Ferdinand Kieckheffer has been elected director of the National Enameling & Stamping Co., succeeding W. G. MacQuire, recently made president of the St. Louis Coke & Chemical Co.

Percy J. Flint, for many years connected with the American Agricultural Chemical Co., is now associated with Eugene Suter & Co.

Robert Tomlinson, the 7-year-old son of G. H. Tomlinson, manager of the New York office of the Midland Linseed Products Co., was killed on Sunday while playing at Owen Field, Maplewood, N. J.

E. J. Barber, of the White Tar Co., Inc., returned last week from a business trip to New England.

The export and import business of the Hagemeyer Trading Co., Inc., 17 Battery Place, has been merged into that of William E. Peck & Co., Inc., whose offices are in the Peck Building, 140 Front St.

The offices of Irving R. Boody & Co., vegetable oils and Oriental products, formerly located on the fifth floor of 82 Beaver St., have been moved to Suite 1211, the same building.

The Brooklyn plant of the Kasebier-Chatfield Shellac Co.., which was destroyed by fire last fall, has been rebuilt and has resumed operations.

R. E. Dorland, manager of the New York office of the Dow Chemical Co., is on a visit to the main plant of the company at Midland, Mich.

Frank McCartney, general sales manager of the Monsanto Chemical Works, St. Louis, is at the New York office for a stay of a few weeks.

The Republic Trading Co. of New York City has increased its capital stock from $25,000 to $2,000,000.

The Bureau of Foreign and Domestic Commerce announces that C. C. Batchelder has recently returned from Calcutta, India. For the next week or longer he will make his headquarters at the bureau's New York office, room 734, Custom House, where he will be pleased to consult with manufacturers, importers, exporters and others interested in trade with India.

Loss estimated at $50,000 was suffered by the Chemical Utilities Co., Cincinnati, on April 6, when fire destroyed a warehouse stored with large quantities of sulphuric acid along with chemicals of a highly explosive nature. This building had just been acquired by the company and was being remodeled for occupancy. Firemen prevented the blaze from spreading to the adjoining property belonging to Fries & Fries, chemical manufacturers.

William C. Schwarz of New York has joined the Bureau of Foreign and Domestic Commerce at Washington and will have charge of statistical work in connection with imports of dyes.

American Institute of Chemistry Holds First Annual Meeting

The first annual meeting of the American Institute of Chemistry was held at the Hotel Breslin, Monday evening, April 9. The meeting was preceded by a dinner which was very well attended.

The secretary announced a charter membership of 150 and a list of 100 applicants whose credentials had not yet been passed upon by the council. The membership roll reveals the fact that both charter members and applicants represent practically every state in the Union. Even in the short period of preliminary organization the scope of the organization extended from coast to coast. The initial steps for the organization of two chapters of the institute in states where the membership is already more than sufficient were announced at the meeting. These two states are New Jersey and New York. Plans for several other state chapters are under way.

The temporary officers and the council chosen at the organization meeting were confirmed for the ensuing year. The following committees and their personnel were announced:

Professional Education—Dr. Casimir Funk, director H. A. Metz Laboratories; Dr. Arthur E. Hill, head of the department of chemistry, N.Y.U.; Dr. Guy Y. Williams, professor of physical chemistry, University of Oklahoma.

Ethics—Dr. Mathew A. Hunter, professor of electrochemistry, Rensselaer Polytechnic Institute; Dr. Benjamin Harrow, associate in biochemistry, College of Physicians and Surgeons; Dr. H. B. Gordon, chemist, U. S. Testing Co.

Membership — C. L. Bryden, 381 Fourth Ave., New York City; H. L. Lourie, U. S. Tariff Commission, Washington, D. C.; James R. H. Stevens, James H. Wallace Co., Stamford, Conn.; Robert E. Pittman, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.

Publicity — Dr. Leon W. Parsons, chief chemist, Tidewater Oil Co., Bayonne, N. J.; Prof. Glen V. Brown, professor of chemical engineering, Bucknell University, Lewisburg, Pa.; Dr. Frederick W. Zons, consulting chemist, 239 Center St., New York City; Adriaan Nagelvoort, chemical engineer, 52 East 41st St., New York City.

Legal—Dr. Lloyd Van Doren, patent attorney, 21 West 44th St., New York City; Dr. W. Lee Tanner, research chemist, Grasselli Chemical Co., Cleveland, Ohio; Dr. Carleton Ellis, consulting chemist, Montclair, N. J.

Classification — Dr. Frederick W. Crane, consulting chemist, Montclair, N. J., and professor of chemistry, Newark Technical College; Dr. Stewart J. Lloyd, professor of chemistry, University of Alabama; Dr. Henry G. Knight, director of the Experiment Station, University of West Virginia.

Employment—L. R. Seidell, manager N. Y. Testing Laboratories; Maximilian Toch, Toch Brothers, 110 East 42nd St., New York City; C. V. Bacon, consulting chemist, 3 Park Row, New York City.

Explosion Rends Dye Plant

An explosion which killed two and injured several others occurred at the plant of the National Aniline & Chemical Co. at Buffalo, N. Y., on April 3. The property damage was slight. The explosion occurred in the mixing and grinding department during an operation common to several other plants belonging to the company. The cause of the accident therefore is unknown and consequently is being carefully investigated.

A representative of the National Aniline & Chemical Co. has stated to a member of the *Chem. & Met.* staff that, contrary to early rumors, no picric acid was present or in process at the time of the blow. The possibility of a dust explosion was also doubted.

Calendar

The following important technical meetings are scheduled for the immediate future:

AMERICAN ASSN. OF ENGINEERS
Norfolk, May 7-9

AMERICAN CHEMICAL SOCIETY
Regular meeting, New York, May 4

AMERICAN ELECTROCHEMICAL SOCIETY
New York City, May 3-5

AMER. SOCIETY MECHANICAL ENGRS.
Montreal, May 28-31

AMERICAN FOUNDRYMEN'S ASSOCIATION
Cleveland, O., April 30-May 3

AMERICAN OIL CHEMISTS' SOCIETY
Hot Springs, Ark., April 30-May 1

AMERICAN WELDING SOCIETY
New York, April 24-27

AMERICAN ZINC INSTITUTE
St. Louis, May 7-8

CANADIAN INSTITUTE OF CHEMISTRY
Toronto, May 29-31

INTERSTATE COTTON SEED CRUSHERS ASSN.
Hot Springs, Ark., May 2-5

SOCIETY OF CHEMICAL INDUSTRY
Canadian Section
Toronto, May 29-31

SOCIETY OF INDUSTRIAL ENGINEERS
Cincinnati, O, April 18-20

New Furnace Tested at M.I.T.

A remarkable series of tests was recently carried out at the Massachusetts Institute of Technology on the Cannon radiating furnace. Essentially this is a combustion chamber in which fuel oil or pulverized coal may be burned at a high rate of speed. This of course implies that the conductivity of the chamber walls is very high, and that is the reason for using carborundum in the walls. As a matter of fact, the Carborundum Co. has purchased the patent rights for this equipment.

The tests at the M.I.T. carried out by Professors Miller and Eames showed a capacity of 320,000 B.t.u. per cubic foot of combustion space for a short time. This is a remarkable figure and gives distinct industrial promise.

Noted Men Receive Medals

The Franklin medal, highest award of the Franklin Institute, was given Sir J. J. Thompson, F.R.S., at a special meeting of the American Philosophical Society in Philadelphia on April 10. He likewise received the John Scott medal and award of $1,000. At the meeting he discussed the possibility of a new form of water molecule.

Other recipients of the Scott medal and the premium were Dr. C. Eijkman of the University of Utrecht, Holland, for his contributions to medical science; Dr. A. L. Day, director of the Geophysical Laboratory of the Carnegie Institute, Washington, for his work in the interpretation of geological phenomena and for producing optical glass, and Dr. F. W. Aston of Trinity College, a leading student of the disintegration products due to radio-activity, who developed a special instrument, known as the mass spectograph, capable of an accuracy of one part in one thousand.

The Scott medals are awarded by the city through the Board of City Trusts. Funds for the purpose were bequeathed to the city in 1816 by John Scott of Edinburgh.

A. De Graeffe, Minister from the Netherlands, received the medal and the premium for Dr. Eijkman, and H. G. Chilton of the British Embassy at Washington accepted them for Dr. Aston.

Fluorspar Situation Alarms Non-Metals Specialists

That the War and Interior Departments in their war minerals activities should include fluorspar is a contention raised by some of the government's non-metals specialists. Some of them go so far as to state that fluorspar is more essential than manganese, since it is possible, in an emergency, to use manganiferous iron ores or to make use of the lower grade manganese deposits. On the other hand, with one exception, no new deposit of fluorspar has been brought in since the beginning of the war.

From this time forward, it is contended, much will be heard of the fluorspar situation. The more readily mined deposits are being exhausted and the apparent lack of domestic resources of this essential flux for the making of basic open-hearth steel is causing apprehension.

A recent questionnaire sent out by the Bureau of Mines to the chief chemists of the principal steel companies brought forth, among other things, the fact that there is no substitute for fluorspar in the making of steel, even at greatly increased prices. In addition, it is the only source of hydrofluoric acid, which also is an essential commodity in carrying on a war.

Cryolite is occasionally used as a substitute for fluorspar. Since the only commercial deposit of cryolite is in Greenland, it would have little bearing on the situation in an emergency.

Phosphate Gains Attention

Extensive Deposits in Idaho Have Been Investigated—Florida's Resources Next to Receive Attention

There are more than 100,000 acres of land in northern and middle Florida believed to contain phosphate rock which have been withdrawn from entry by the Interior Department. Individuals assert patent rights to some of this property and a number of discrepancies in records have developed. Much of the land, however, never has been claimed for patent by private individuals.

Geological work of investigation of these lands is to be conducted by G. R. Mansfield and G. W. Holland of the Geological Survey. The latter already is in Gainesville comparing records and he will be joined by Mr. Mansfield before the end of the month.

The phosphate deposits of Florida are rated as the richest in the United States, particularly the pebble phosphate east of Tampa. In the northern part of the state, the phosphate is hard rock or slate rock. The deposits on private lands have been extensively developed, principally for export demand. Development has slackened recently owing to a decrease in this demand occasioned in part by the development of phosphate in northern Africa, which, although of a lower grade, is closer to the German and French fertilizer markets.

Mr. Mansfield is completing a report on the phosphate deposits of Idaho which will be submitted to Acting Director P. S. Smith of the Survey before he goes to Florida. The Idaho deposits are extensive and of good grade. The greatest development in that state is that of the Anaconda Copper Co. which has built a 7-mile railroad to its phosphate mine and has established a plant to produce superphosphates, using acids from its other plants.

Glass Patent Question Closed

The Supreme Court will not consider the validity of the basic patents involved in the conversion of the glass industry from a hand-blowing to a machine-drawing art. Considerable interest is attached to this decision by the glass industry.

The Window Glass Machine Co. and the American Window Glass Co. sought to bring up for review a case against the Pittsburgh Plate Glass Co. in which the federal District Court for western Pennsylvania held that the patents had not been infringed. It was contended by the companies interested in maintaining control under the patents that in a long list of adjudicated cases presenting similar controversies the federal courts had sustained the validity of the patents. The main patents at issue, it was asserted, had "revolutionized" the industry.

The Third Circuit Court of Appeals affirmed the decision of the District Court, which, it was declared, had reversed a long line of decisions.

Develops Successful Mask

Development of a "universal gas mask" which is considered to have the widest application of any gas mask thus far devised and which fills every demand that may reasonably be made on a gas mask is announced by the Department of the Interior as the result of experimental work performed by the Bureau of Mines at its Pittsburgh, Pa., station. The department also announces the development of a "fireman's canister" which is similar to the "universal canister" but is smaller and lighter, thus making it more convenient for the use of city firemen. By the use of these types of gas masks, workers in many metallurgical and chemical plants may encounter a variety of gases and city firemen may meet almost any type of gas or vapor and do work that they could not do otherwise except at the risk of death or serious disability.

The canister contains granular absorbents, consisting of activated charcoal, for removing organic vapors; a filter of cotton wool for removing smokes, dusts and mists; caustic soda fused on pumice stone for removing acid gases; another cotton-wool filter; fused calcium chloride for extracting water vapor that inhibits action of the next absorbent; "hopcalite," a mixture of oxides of manganese and copper with sometimes silver and cobalt that destroys carbon monoxide; and finally silica gel for absorbing ammonia.

News Notes

French metallurgical production is again gaining slowly. Coke supplies available are gradually growing up. Belgium and Holland are supplying small amounts, while a considerable quantity is beginning to come in from Czechoslovakia.

Technical courses of broad range are to be given at Carnegie Tech. during the coming summer. The school will open June 25 for 8 weeks. The colleges of engineering and industries are to offer an especially good choice in the work which may be taken.

Three airplanes, loaned by the War Department, are now being fitted up for the boll weevil campaign by the Department of Agriculture. If this work is successful, further funds will be used in dusting calcium arsenate by this means.

Five research fellowships, each of value of $810 per year, are open at the College of Mines, Seattle, Wash. The following subjects have been selected for investigation. Coal washing, electrometallurgy, ferrous metallurgy, superrefractories, and white ware bodies. Applications are due not later than May 10 and should be addressed to Dean Milnor Roberts.

Newsprint, woodpulp and lumber are the chief products that contributed to the increase in Canada's exports to the United States for the 11 months of the present fiscal year, as compared with the corresponding period of the last fiscal year, ended March 31. The group of wood, wood products and paper, to which these articles belong, account for more than half of the total increase of $63,000,000 in the total exports to the United States.

Ceramic wares of all kinds are to be produced in growing volume in the United States if the present expansion of the pottery industry is a correct indication of the tendency of the times. Many new additions are in sight in every line from heavy sanitary ware to fine china. The Westinghouse High-Voltage Insulator Co. is to open a new plant in California early in June for the production of electrical insulating porcelains.

Paper men in New York during the week of April 9 staged many affairs of unusual interest. The Technical Association held several sessions, very largely attended, of definite practical value. The exposition at Grand Central Palace lived up to expectations. An account of the week's proceedings and of the exposition will appear in next week's *Chem. & Met.*

Hartford engineers and chemists are considering the formation of an engineers' club. Six technical societies have chapters in or near the city. On April 21 a joint trip, dinner and meeting of all interested is to be held. At this time the new plant of the Hartford Rubber Works is to be open to inspection.

Over 4,000,000 lb. of various metals is to be placed open for bids by the navy on April 19. Brass, copper, aluminum, zinc, bronze and Monel metal are included in the list.

Varied industrial plants, thirty in number, have just been visited by the senior class of the engineering college of the University of Kentucky in a spring tour covering the Buffalo-Pittsburgh centers.

The Ruhr export situation, despite much discussion and many assurances of improvement, remains practically unchanged. German exporters have been instructed by their government not to pay the 10 per cent duty imposed by the French. The blockade remains as effective as ever.

The Gypsum Industries Association of Chicago has been found not guilty of violation of anti-trust laws. The government, through the Federal Trade Commission, has dropped its charge of manipulation to obtain monopoly.

Lignite or brown coal is being used in many German industries, including those producing potash and nitrogenous fertilizer. Power stations, glass and potteries factories are also using lignite for fuel, mainly in form of briquets.

Exceptionally strong fertilizers are obtained by the treatment of Vesuvian lava, according to a dispatch just received from Milan. A phosphoric solution is used in this treatment. If practical results bear out expectations a new fertilizer for Italian agriculture will be available.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices
Imports and Exports
The Trend of Business

Active Movement in Heavy Chemicals Absorbs Domestic Output

Trading in German Chemicals for Shipment Restricted—Permanganate of Potash in Strong Position—Arsenic Irregular—Active Call for Tartaric Acid—Higher Prices for Imported Potassium Bromide

CONTINUED call for contract deliveries of heavy chemicals is taking up the bulk of production. New business placed during the week was not large, but this is accounted for by the fact that the large consuming trades are covered ahead. The total movement so far this month has assumed record proportions. The situation surrounding chemicals of German origin is growing more complex. This has resulted in uncertainty regarding shipments and in some cases importers have withdrawn quotations, as no assurance can be given that deliveries will be made within the time limits specified. This condition is true not only of chemicals coming from the Ruhr Valley but also of those from other sections of Germany, as the raw materials in many cases are drawn from the Ruhr. Furthermore the imposition of export taxes on goods shipped from the latter section has a demoralizing effect on business. To add to the confusion the German Government is reported to have advised exporters not to pay the export taxes and if this policy is followed out, no permits for shipment will be issued.

Building Operations Increase

Reports on building operations show that activity in that line is going on unabated. This accounts for the heavy consumption of such chemicals as enter into the dry color trade and other branches of the paint and varnish industries. Substantial decreases in the shortage of freight cars also is reported and fewer complaints are heard about delays in shipping chemicals.

Prices for the majority of chemicals of domestic origin have held a steady position with a firm tone generally noted, due to good consuming demand and strong producing costs. Most imported chemicals have shown a tendency to advance and this is especially true of all potash compounds. Arrivals of foreign made chemicals were of good volume but in most cases they were sold ahead and had little if any influence as price factors. Some speculation has arisen with reference to new contract prices for soda ash and other basic chemicals as it is feared that advances in price are probable, but as these new prices will not be announced for a long time, there may be many changes in fundamental conditions which will nullify present calculations.

Acids

Acetic Acid—Glacial is reported to be easy with some resale lots to be had at price concessions. First hands quote the market unchanged at $12.05@12.85. The lower grades are moving steadily to consumers and prices are well maintained. Quotations are on a basis of $3.17½ for 28 per cent and $6.35 for 56 per cent.

Boric Acid—Producing costs are fairly steady and consuming requirements are up to expectations. The market is reported to be established on a steady basis and no price fluctuations seem in prospect for the near future. Powdered and crystals are quoted at 11c. per lb. in sacks, 12c. per lb. in barrels and 12c. per lb. in kegs.

Citric Acid—Cables indicate a strong market abroad and 52c. per lb. is given as the lowest price for shipments. Consuming interest is good and unless a change takes place in the foreign situation the probability of still higher prices is bright. Domestic goods are firm at 49@50c. per lb.

Hydrofluoric Acid—Buying has been along quiet lines and prices are steadied only by the strong position of raw materials. Export demand is not in evidence. Prices are held at 7@7¾c. for the 30 per cent and 11@11½c. for 48 per cent.

Lactic Acid—Shipment prices for foreign material have been high enough to shut off much business from that direction and that is one reason for the firm condition of the present market. Domestic makes have been finding a ready outlet and prices for all selections are strong. Quotations are 4½@5½c. for 22 per cent dark and 5½@6½c. for 22 per cent light.

Oxalic Acid—Only small lots of imported material were on the market and they were held at 13¼@13½c. per lb. One lot of 30 bbl. was reported to have been offered at the outside figure. Demand has not been active but restricted imports has a steadying effect on values. Domestic oxalic holds at 12¾c. per lb. at the works with small lots commanding the usual premiums.

Sulphuric Acid—Contract deliveries are taking up the bulk of production and many producers are unable to accept orders for prompt shipment. This places the market in a strong position. Quotations are $9@$10.50 per ton for 60 degree and $15@16 per ton for 66 per cent. These prices are for tank cars at the works.

Tartaric Acid—Active buying has featured this material. Consumers have covered as far ahead as possible and with prices going up they have taken spot offerings in large volume. Imported could still be procured at 34c. per lb. but 34½c. per lb. was asked in several directions. Domestic grades were steady at 35c. per lb.

Potashes

Bichromate of Potash—Transactions have been confined to small lots and sellers have been eager to book whatever business was in sight. Prices as low as 10½c, per lb. f.o.b. works were heard and ranged upward to 10¾c. per lb. Offerings are not heavy and price fluctuations seem to be influenced more by the volume of trading than by any other factor.

Chlorate of Potash—The shipment situation with reference to most potash compounds has given concern regarding future supplies of foreign goods. This has been noted in the market for chlorate and as spot stocks are pretty well depleted, a firm market has been created. Quotations on spot are given at 7½@7¾c. per lb. but there is not much to be had, especially at the inside figure. Domestic chlorate is offered at 8½@9c. per lb. f.o.b. works.

Carbonate of Potash—Business has been held down to small proportions by the absence of spot goods. Small lots of hydrated 80-85 per cent have changed hands at 7¾c. per lb. Calcined 80-85 per cent is in a wholly nominal position. Shipment prices are based on so much uncertainty regarding deliv-

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	181.48
Last week	181.61
April, 1918 (high)	286.00
April, 1919	231.00
April, 1920	261.00
April, 1921 (low)	140.00
April, 1922	158.00

The weekly index number shows a moderate decline of 0.13 point occasioned by the slightly easier situation in fertilizer materials and a ½c. drop in refined glycerine.

eries that they mean hardly anything. Demand has not been active, as most consumers laid in supplies when danger of curtailed shipments first became manifest.

Caustic Soda—Higher prices for shipment have been quoted and this has resulted in a very firm market for spot holdings. Sales of 88-92 per cent have been made at 8¼c. per lb. on spot with some sellers asking 8½c. per lb. Shipment prices are quoted at 8¼c. to 8½c. per lb., according to seller. Home producers are firm in their views and maintain carlot quotations for 88-92 per cent at 8¼c. per lb. f.o.b. works.

Permanganate of Potash—Irregularities in price have continued to feature the market for permanganate. This undoubtedly was caused by sales of odd lots at private terms and at prices which did not represent the market, as further lots were not available at those terms. The general asking price at the close was fixed at an inside figure of 25c. per lb. Some goods afloat sold at 25c. per lb. Some importers have withdrawn all quotations for shipments and futures can not be quoted at any level with assurance that deliveries will be made within the contract specifications.

Potash First Sorts—Last trading went through at 8c. per lb., but late in the week leading handlers marked up the quotation to 9c. per lb. nominal. Offerings were scanty, as production has been restricted because of the low selling prices obtaining at the different centers of distribution.

Sodas

Acetate of Soda—Buyers have been showing but little interest and this has given an easy tendency to prices. Leading factors are reluctant to lower quotations and are giving 6c. per lb. as the asking price but on firm bids there is no difficulty in shading that figure materially.

Bichromate of Soda—Although producers are finding a good call from contract holders and a good part of production is being absorbed in this way, there is no scarcity of stocks and selling competition is a factor. The quotation is held at 7½c. per lb., f.o.b. works, but some reports say that equalizing freight rates on delivered prices has practically resulted in price cutting. However, there are different instances where sellers are known to have maintained the quoted price levels, and the business has gone to the maker whose plant was nearest the point of delivery. Fundamentally the market appears to be in a firm position, as producers are operating on a small margin. Chrome ore is quoted at $20.50 per ton, c.i.f. Atlantic ports for Indian, $24@$26 per ton for New Caledonian, and $20@$22 per ton for Rhodesian.

Caustic Soda—There is no abatement to the heavy movement to domestic consumers. Buyers not only hold contracts for amounts considerably above normal, but they also are prompt in asking for deliveries and it is evident that consumption is keeping pace with production. Some producers are unable to accept new business for April delivery, while others quote former prices of 2½c. per lb., works, basis 60 per cent, and are able to make prompt shipments. Dealers are asking 3.50c. to 3.60c. per lb. on spot for 76 per cent solid and small lots sold this week as high as 3.80c. per lb. ex-store. Recent sales for export were made at 3.40c. per lb., f.a.s., and while this price is still heard it is purely nominal for prompt shipment, as the sellers admit they are sold ahead. The best price for export is given at 3.45c. per lb. f.a.s. and up to 3.50c. per lb. has been paid.

Chlorate of Soda—A lot of imported chlorate was scheduled to be sold at auction on Thursday. This lot was held in bonded warehouse in Brooklyn and different members of the trade were on hand at the appointed time to present bids, but the owner paid the charges which had accrued and the auction did not take place. Offerings of imported on spot are limited and values for good quality are steady at 6½@6¾c. per lb. Domestic makers continue to ask 6½c. per lb. at the works and upwards on a quantity basis.

Fluoride of Soda—Consumers have been taking more interest in this chemical and the volume of business placed shows a material gain. The undertone to prices is strong, and quotations have been marked up to an inside figure of 9½c. per lb.

Hyposulphite of Soda—Recent lowering in prices has failed to stimulate buying to any pronounced degree and another quiet week was reported by sellers. Foreign offerings continue to compete actively with domestic makes and this prevents any real stability to values. Quotations are repeated at $2.50@$2.75 per 100 lb.

Nitrate of Soda—Current business is fairly good for this time of year and while demand in the South has fallen off, there is a steady movement to Northern consumers. Prices are quotably unchanged at $2.65 per 100 lb. ex-vessel, although some sellers have tried to effect sales at higher levels. Business for forward positions is quiet, as domestic buyers feel that new price schedules may work out more in their favor in view of slow call for nitrate from European countries.

Nitrite of Soda—Some improvement in trading was reported in the past few days, but the market is still far from active. Importers are offering freely, but already are quoting close to actual laid down cost and are unwilling to shade prices further. Asking prices for imported are given as 8½@9c. per lb. depending on quantity and seller. Domestic grades are quiet at 10@10½c. per lb.

Soda Ash—While new contract prices are still several months off, there is considerable speculation on the part of buyers regarding them. In view of the unusually heavy movement so far this year and the increased cost of production it is believed that the new prices will be established on higher price levels than are now quoted. There was no change in the spot on shipment market during the week. Some sellers say if deliveries continue throughout the month on the same scale as during the first half of the month, that April will show a record disappearance. Prompt deliveries of light ash are offered by dealers at $1.75 in bags and $1.95 in barrels. Producers quote contracts at $1.20 in bags and $1.40 in barrels, carlots works, basis 48 per cent. Dense ash holds at $1.25 in bags and $1.45 in barrels.

Miscellaneous

Acetone—Producers reported a steady market, production in several directions being well sold up. The prices were maintained by first-hands at 22@22½c. per lb., the inside figure obtaining on carload lot transactions.

Antimony Oxide—While the undertone of the market reflected the firmer situation in China, prices underwent no further change. White oxide, 99 per cent, held at 9c. per lb. Standard needle antimony, powdered, was available at 8c. per lb. On the lump 7¾c. per lb. represented the market. Several shipments arrived here during the past week.

Acetate of Lime—Demand was moderate, but prices held on the old basis of $3.50 per 100 lb. Production in February was officially placed at 13,894 lb., against 16,544 lb. in January and 7,993 lb. in February a year ago.

Arsenic—Sales of spot goods were reported at 15½c. per lb. and some material afloat sold at the same figure. The general asking price for spot, however, was 15½c. per lb. Moderate sized arrivals reached the local market from different foreign countries, but most of this went out direct to consumers and there has been no gain in the holdings of local sellers.

Calcium Arsenate—Reports from Washington state that the supply of calcium arsenate will be considerably larger than had been forecast some time ago, but still there will be a scarcity of something like 6,000 tons. Orders for large amounts are reported to be on the market. Prices are firm at 17½@18c. per lb.

Copper Sulphate—Arrivals of imported sulphate were again noted during the week. Prices for imported grades are rather easy and range from $5.70 to $5.85 per 100 lb. Domestic makes are not moving freely and in general a quiet week was reported. Quotations of domestic sellers are $6.25@$6.50 per 100 lb.

Potassium Bromide—Imported potassium bromide was raised 1c. per lb., closing prices ranging from 16½@17c. per lb., immediate and nearby delivery. Importers refused to name a flat price on forward material because of the shipping situation abroad and the market on futures was entirely nominal.

Coal-Tar Products

Phenol on Spot Higher—Consumers of Cresylic to Ask for Lower Tariff Rate—Naphthalene in Demand and Firm

THE inquiry for phenol was active and the market in "outside" channels developed further strength, resale parcels moving at higher prices. At least three new sources of production will compete for business this fall, but until the output of domestic producers can be increased the trade expects prices to hold relatively firm. The situation in cresylic acid attracted widespread attention. The supply available from domestic sources is inadequate and large consumers have been hard hit by the high tariff on foreign material. At a meeting of importers and consumers held early in the week, a committee was appointed to present the matter before the Tariff Commission in the hope that something might be done to change conditions. The committee will apply for a 50 per cent reduction in the duty. Importers were not disposed to quote on shipment goods except on a flat c.i.f. basis, the buyer to look after all tariff charges, etc. In naphthalene the market presented a rather firm front covering spot and nearby goods, but on futures the outlook appeared to favor buyers. Foreign cables on crude were nominally unchanged. Easier exchange was a factor at different times. Importations of aniline colors from Germany have been larger of late, but apprehension is felt in regard to the supply situation from now on, as the developments in the Ruhr have been decidedly unfavorable. Domestic producers, of course, welcome this opportunity to push their wares in domestic as well as foreign markets. The intermediates reflected the steady situation in the important bases, but prices named covered a wide range, depending upon the make, quantity and delivery.

Coal-Tar Crudes, Etc.

Benzene—Leading factors reported the market unchanged, the demand being sufficient to hold prices on the old basis. Production has been larger and some traders feel that the demand will have to improve considerably in order to bring out any showing of strength in the market. The contract price held at 27c. per gal.

Cresylic Acid—Interest in the tariff situation attracted the attention of producers. Consumers of cresylic acid are dissatisfied with the rate of duty now in force and an attempt will be made to have the rate cut in two. Trading in foreign material was limited in volume because of the "prohibitive" tariff, although it was common gossip that certain consumers were much in need of supplies. English material for shipment held around 85c. per gal., in bond, c.i.f. basis. On spot the market for cresylic ranged from $1.30@$1.50 per gal. as to quality, etc. Domestic producers were "sold up" and from all indications will not be in a position to offer supplies in the open market for some time to come.

Naphthalene—Several shipments of crude arrived from abroad last week. The foreign markets for crude ruled firm at the recent advance to 3½@3⅝c. per lb., c.i.f. New York basis. Demand for flake and balls was good, the former holding at 9¼c. per lb., while the latter was more or less nominal at 10½@11c. per lb.

Phenol—Resale offerings were limited to small lots only and prices developed further strength, actual business passing at 53@55c. per lb., immediate delivery. At the close 55c. apparently was the general asking price. Leading domestic producers were not in a position to quote, the output being sold up ground 26@28c. per lb. It was reported in trade circles that three manufacturers were pushing plans to re-enter the field, but new production cannot reach the open market for some months to come. Surplus war material is being consumed at a rapid rate and the supply situation is regarded as a serious one.

Solvent Naphtha—A report to the effect that a large petroleum refiner was in a position to offer solvent naphtha in a liberal way could not be confirmed. Producers regard the situation as firm, having nothing to offer because of the sold-up condition of the market. The nominal quotation on the water-white was unchanged at 37@40c. per gal.

Toluene—Trading was inactive, but with nothing pressing on the market prices were reported at 30@35c. per gal.

Beta-Naphthol—The market was a little irregular in outside channels, scattered lots offering at a shade under 23c. per lb. for the technical variety. Producers, as a rule, hold out for 23½c. per lb. Demand was quiet.

Alpha-Naphthylamine—A firmer undertone featured the market and there was talk of higher prices in some directions. At the close prices ranged from 36@38c. per lb., according to quantity and seller.

Benzoic Acid—There were offerings of the U.S.P. grade for immediate delivery at 72@74c. per lb. Demand was fairly active and prices presented a firm appearance.

Naphthionic Acid—The crude closed at 55@60c. per lb. Prices were unsettled on freer offerings.

Ortho-Toluidine—Closing prices were firmer and the range was revised to 14@15c. per lb. for spot material.

Para-Amidophenol — The base was available at $1.20@$1.30 per lb., depending on the brand and quantity. A firmer undertone was apparent in nearly all quarters.

Resorcinal—There were offerings of the technical at $1.40@$1.50 per lb., in kegs, with the pure nominal at $2@$2.10 per lb. Trading was slow, but prices at the close were steady.

Quiet Week for Alcohol

First hands reported a quiet week, yet prices did not change. Denatured alcohol was a shade easier in some directions because of the seasonable slump in the demand. The No. 1, 188 proof, held at 39c. per gal., with the No. 5 grade at 38c. Ethyl spirits, 190 proof, closed nominally at $4.75@$4.85 per gal. Methanol, 95 per cent, settled at $1.19@$1.21 per gal. Production of methanol in February was placed at 773,179 gal., against 933,171 gal. in January and 457,656 gal. in February a year ago.

Chemists Investigate Ruling on Glycerine Patent

A committee of the Manufacturing Chemists' Association is investigating the recent action of the Commissioner of Patents in upholding a German allegation of infringement on a patent covering a process for glycerine reduction.

A government employee named Eoff obtained a patent on this process in 1917, which he dedicated to the public. After the enactment of the Nolan act, a German interest filed a contest proceeding, alleging infringement. In that protest it was stated that the reduction process had been perfected in Germany prior to 1917 and had not been patented in the United States solely because of war-time restrictions. The contention of the Germans was upheld by the Commissioner of Patents.

The Manufacturing Chemists fear that were this ruling allowed to stand it would constitute a dangerous precedent in that it would give aliens an opportunity to claim patent rights to which they are not entitled.

Commodity Markets in France

In the naval stores industry the first gathering of the new crop is now taking place under good conditions. Some turpentine from the new crop will be on the market toward the end of April, and the dry products about the middle of May. The French Government denies prohibition of exports.

Stocks of essential oils are too low for the demand.

The production of acids in general is increasing and the market is strong. Of these, sulphuric acid is the most active; the superphosphate and sulphate of ammonia industries, however, are flourishing. Nitric acid is calmer because of difficulties in the metallurgical industry. The secondary chemicals are active largely on account of the Ruhr developments.

The paint and dyestuffs markets are active; buyers, however, are hesitating to cover themselves for long periods because of high prices.

The production of alcohol in France during the period Sept. 1 to March 1 totaled 1,323,000 hl., compared with 1,027,000 for the same period the previous year. The prohibition of the export and import of molasses was reestablished by decree on March 14.

Vegetable Oils and Fats

Linseed Oil Again Higher—Crude Cottonseed Steadies—Coconut at 8¼c. Coast—Palm Oils Unsettled

TRADING in vegetable oils and fats was not active, but with stocks available for immediate consumption rather light, the tendency of prices, in the main, favored sellers. Linseed was marked up 3c. per gal. Coconut sold off a little on the Pacific Coast on resale offerings, but this failed to unsettle the market in first-hand quarters. Cottonseed ruled firm despite the talk of a substantial increase in the cotton acreage. Tallow ruled firm on the 9c. basis for the extra.

Linseed Oil—Closing prices were 3c. per gal. higher than a week ago, carlots, April-May shipment, settling at $1.17 per gal. Several crushers refused to quote on full carlot business, nearby delivery, and restricted operations to less than carlots at $1.20 per gal. June oil, carlots, settled at $1.14 per gal., with July forward at $1.10@$1.11 per gal., according to the seller. A parcel of six cars of raw oil sold for July-August-September delivery, two cars each month, at $1.09 per gal., this sale going through just before the advance was announced. Crushers in the East are operating at full capacity, but with the output of the Western mills restricted the supply situation remains tight. A crusher in the West went on record with a statement to the effect that no improvement in the domestic situation could set in before June, at which time the Western plants should have enough seed on hand to resume operations on a normal scale. Foreign oil sold at $1.09 May shipment. April shipment was offered at $1.11½ per gal., duty paid, landed weight, c.i.f. New York. There was a good inquiry for nearby foreign oil.

Cottonseed Oil—Late in the week several cars of crude sold at 10⅝c. per lb., f.o.b. Memphis, indicating that prices stiffened a little. Actual consuming demand for refined oil and compound lard held up well, considering the increased competition with lard, and the trade is speculating on a favorable March report, private estimates on the disappearance ranging from 190,000 to 230,000 bbl. The available supply for the remainder of the season is short of requirements, calculating on a normal volume of business, and most refiners favor the long side of the market. Bleachable oil sold at 11½c., buyers' tanks, f.o.b. Boston. Lard compound held at 13½c. per lb., carlots, f.o.b. New York. Oleo stearine closed steady at 11c. per lb. asked. Hogs in Chicago brought from $7@$8.50 per cwt.

Corn Oil—There were sales of crude in the Middle West at 10⅝c. per lb., tank cars, f.o.b. mills.

Coconut Oil—The sale of two tanks of Ceylon type oil on the Pacific Coast at 8⅜c. per lb., a decline of ¼c., failed to shake the confidence of local traders. This sale involved resale material and leading handlers continued to quote the market at 9c., sellers' tanks, coast, and 9¼@9⅜c., sellers' tanks, New York. A mill on the coast has been forced to shut down temporarily because of the shortage in copra. Copra, sundried, held nominally at 5⅝c. per lb., c.i.f. coast.

China Wood Oil—Meager spot holdings were maintained at 35@37c. per lb. A parcel of May arrival oil was available at 30c., while May-June shipment from the Orient sold at 26½c. per lb. Shorts are being badly squeezed.

Palm Oil—A cargo arrived from Africa, but this oil went directly into consuming channels. Lagos oil for shipment was irregular at 8¼@8⅜c. per lb. Niger oil for shipment was available at 8⅜c., c.i.f. New York, a decline of ¼c.

Sesame Oil—Prompt shipment from Rotterdam closed at 12¼c. on the refined grade, duty paid, New York. On May business the nominal quotation was 12¼c., with intimation that 12c. might go through on May-June.

Peanut Oil—Crude peanut in the South was scarce and 14c. was the general asking price, tank cars, f.o.b. mills.

Soya Bean Oil—Sales of April shipment from the coast went through at 10⅜c., duty paid, sellers' tanks. At the close 10½c. was asked for April and 10⅝c. for May, Pacific Coast ports. In New York the market for nearby oil held at 10⅜c., duty paid, tank car basis. On bulk oil for shipment from the Orient 8c. was asked, in bond, c.i.f. New York.

Menhaden Oil—The sale of a round lot of crude menhaden oil was reported last week at 55c. per gal., tank car basis, f.o.b. northern plant, an advance of 5c. from the trading level of the week previous. The oil sold on the "if made" basis. It is estimated that more than 22 000 barrels have been disposed of to date.

Tallow and Greases—Bids for city extra tallow at 9c. ex-plant were turned down. The market settled at 9¼c. asked. At the London weekly auction, held on April 11, 1,018 casks of tallow were offered and 721 sold at prices that were 6d. to 1s. higher. Greases in the New York trade were firm on scanty offerings. Good quality yellow settled at 8½@8⅝c. per lb.

Miscellaneous Materials

Glycerine—Chemically pure glycerine was not subjected to any further price changes, leading refiners holding the market on the 18c. per lb. basis, drums included. The demand was inactive, but with no weakness in crude the undertone steadied. Dynamite was quiet, yet producers' ideas held at 16½@17c. per lb., carlots, f.o.b. shipping point. No sales were reported. In crude the feature was the apparent willingness on the part of refiners to consider foreign offerings. Soap-lye, basis 80 per cent, sold in the West at 10¼c., carlots. At the close 10½c. was considered inside. Saponification held around 12c., loose, carlots, f.o.b. point of production.

Casein—Several round lots of casein arrived at New York from foreign ports. The offerings were scanty, as production in this country has not yet assumed normal proportions. Nominal spot prices for the technical grades ranged from 23@26c. per lb. Shipment prices were wholly nominal, as buyers could not be interested at this time.

Lithopone—Producers reported a steady call for lithopone, and with no change in basic products the market ruled firm in all quarters. Domestic held at 7c. per lb. in bags, carlots, nearby positions.

Naval Stores—The new crop season is now at hand and consumers refuse to anticipate in their wants. As a result prices for turpentine softened a little and nominal quotations at the close ranged from $1.58@$1.59 per gal. Export demand, according to advices from Savannah, has suffered by the recent sharp advance in prices. It is yet too early to forecast production. Rosins were nominally unchanged. The "B" grade held on the basis of $6.20 per barrel.

Pyrites—Prices were steady in sympathy with foreign markets. Imported lump and fine held at 12c. per unit, ex-steamer, Atlantic port.

Shellac—With no important change abroad and inquiry here much better, the market for shellac was fairly steady at the close. T. N. sold at 76c. on spot, and 75c. ex-dock. Bleached, bone dry, was offered at 89c. per lb., immediate delivery, while on futures nominal quotations of 85@86c. were named. Superfine orange on spot was traded in at 80c. per lb. T. N. for shipment from Calcutta settled at 70c. c.i.f. New York.

White Lead—The official contract price of the metal did not change, holding at 8.25c. per lb., New York. Corroders report an active market for white lead and with no accumulation in stocks regard the situation as firm. Painting operations are of huge proportions and the output of corroders will be taxed to the limit. Standard dry white lead, basic carbonate, held at 9⅜c. per lb., in casks, carload lots or more. Dry red lead was quotably unchanged at 11.40c. per pound, round-lot basis.

Zinc Oxide—With no important change in the metal prices for oxide were repeated on the old basis. Demand was active and the undertone was steady in all directions. American process, lead free, was offered at 8c. per lb., carload lot basis. The leaded grades held at 7@7¼c. per lb. Domestic producers quote 9⅜c. on the French process, red seal.

Imports at the Port of New York

April 6 to April 12

ACIDS—33 dr. cresylic, Glasgow, Order; 147 dem. formic, Hamburg, Innis, Speiden & Co.; 40 cs. stearic, Rotterdam, M. W. Parsons; 376 bales stearic, Rotterdam, Smith & Nichols, Inc.; 30 csk oxalic, Rotterdam, Freeff & Co.; 5 cs. butyric, Hamburg, Order; 141 pkg. formic, Hamburg, Int'l Accept, Bank.

ALUM, CHROME — 20 bbl., Hamburg, Hummel & Robinson.

AMMONIA—14 dr., Callao, Duncan, Fox & Co.

AMMONIUM BIFLORID—14 bbl., Hamburg, Innis, Speiden & Co.

AMMONIUM NITRATE—10 cs., Bremen, Pfaltz & Bauer; 1,157 csk., Hamburg, Kuttroff, Pickhardt & Co.

AMMONIUM PERSULPHATE—20 kegs, London, J. Turner & Co.

ANTIMONY OXIDE—190 bg., London, Wah Chang Trading Corp.

ANTIMONY SULPHIDE—7 csk., London, F. B. Vandegrift & Co.

ARSENIC — 188 csk., Hamburg, A. J. Marcus & Co.; 195 cs., Kobe, McKenzie & Foster; 250 cs., Kobe, H. Sundheimer, Inc.; 271 cs., Kobe, Takata & Co.; 127 cs., Kobe, S. W. Bridge & Co.; 120 cs., Kobe, Busk & Daniels; 600 cs., Yokohama, Chipman Chem. Eng. Co.; 46 csk., London, Order; 100 csk., Hamburg, R. W. Greeff & Co.; 200 csk., Hamburg, Order.

BARIUM CARBONATE—252 bg., Hamburg, Hardy & Ruperti; 149 csk., Hamburg, Order.

BARIUM CHLORIDE—56 bbl., Hamburg, Innis, Speiden & Co; 72 csk., Hamburg, Meteor Prod. Co.

BARIUM NITRATE—40 csk., Hamburg, Roessler & Hasslacher Chem. Co.

BARYTES — 550 bg., Hamburg, L. A. Salomon & Bros.; 135 csk., Hamburg, A. Klipstein & Co.

BORATE LIME—6,744 pkg., Mejillones, Pacific Coast Borax Co.

CASEIN—1,668 bg., Buenos Aires, Bank of America; 1,161 bg., Buenos Aires, Order; 350 bg., London, C. Tennant & Sons.

CALCIUM CHLORIDE—146 dr., Hamburg, Order; 95 dr., Hamburg, Bauer & Co.

CAMPHOR—50 cs., Kobe, Iwai & Co.; 225 cs., Kobe, Mitsui & Co.; 50 cs., Kobe, Vick Chem. Co.; 50 cs., Kobe, E. J. Barry, Inc.; 100 cs., Kobe, Nivoa Nitration Works.

CHEMICALS—18 cs., Havre, Order; 47 csk., Hamburg, Chaplain & Bibbo; 30 dr., Hamburg, Order; 17 cs., Bremen, Pfaltz & Bauer; 20 bg., Danzig, Hardy & Ruperti, Inc.; 312 pkg., Hamburg, Roessler & Hasslacher Chem. Co.; 74 dr., London, Mallinkrodt Chem. Wks.; 539 pkg., Hamburg, Order; 114 bbl., Hamburg, Truempy, Faesy & Besthoff, Inc.

CHALK—500 tons, London, Taintor Trading Co.; 1,000 bg., Antwerp, Irving Bank.

COAL-TAR DISTILLATE—30 dr., Glasgow, Order.

COLORS—21 pkg., Havre, Irving Bank; 10 pkg., Marseilles, Order; 90 pkg. earth, Leghorn, H. J. Waddell & Co.; 12 bbl. aniline, Rotterdam, Wetterwald & Pfister; 4 bbl. do., Rotterdam, Order; 10 csk. dry, Southampton, Order; 10 bbl. dry, Hamburg, Kuttroff, Pickhardt & Co.; 18 pkg. aniline, Hamburg, Kuttroff, Pickhardt & Co.; 32 csk. aniline, Hamburg, H. A. Metz & Co.

COPPER SULPHATE—98 csk., Marseilles, P. H. Brothers; 329 csk., Hamburg, Order; 200 bbl., Hamburg, Order; 102 csk., Hamburg, Order; 200 csk., Liverpool, Nitrate Agencies Co.; 200 csk., Liverpool, Order.

CUTCH—300 cs., Singapore, Order.

DEXTRINE—100 bg., Hamburg, L. A. Salomon & Bros.

DIVI-DIVI—1,685 bg., Maracaibo, Suzarte & Whitney.

DYES—21 cs., Havre, B. Weiner.

EPSOM SALT—5,900 bg., Hamburg, Superfos Co.; 500 bg., Hamburg, Brown Bros. & Co.; 7,000 bg., Hamburg, Irving Bank.

GLAUBERS SALT—200 bg., Hamburg, Order; 253 csk., Hamburg, Globe Shipping Co.; 250 bbl., Hamburg, E. M. Sergeant & Co.; 158 bbl., Hamburg, Order.

GLYCERINE—100 dr., Marseilles, Order; 140 bbl., Marseilles, Order.

GRAPHITE — 150 bg., 254 csk., Marseilles, Order.

GAMBIER—150 bg., Singapore, Bank Line Trans. & Trdg. Co.

GUM—20 pkg. tragacanth, Thurston & Braidich; 40 cs. olibanum, Glasgow, Brown Bros. & Co.; 32 bg. myrrh., Glasgow, Am. Ex. Nat'l Bank; 210 bg. copal, Singapore, Guaranty Trust Co.; 271 bg. copal, Singapore, L. C. Gillespie & Sons; 199 bg. copal, Singapore, Brown Bros. & Co.; 100 cs. damar, Singapore, Chase Nat'l Bank; 210 bg. copal, Singapore, Order; 100 bg. arabic, London, Order; 200 bg. copal, Antwerp, A Hurst & Son; 600 bg. copal, Antwerp, Brown Bros.

HEXAMETHYLENE—80 cs., Hamburg Industrial Trust Co.; 10 cs., Hamburg, A. Klipstein & Co.

IRON OXIDE—228 bbl., Malaga, Hummel & Robinson; 76 bbl., Malaga, Reichard, Coulston, Inc.; 70 bbl., Malaga, J. L. Smith & Co.; 319 bbl., Malaga, C. K. Williams.

MAGNESIUM—1,119 bg., carbonate, Glasgow, Order; 170 bbl., chloride, Hamburg, A. Blanc; 70 csk., chloride, Hamburg, Order; 551 csk., calcined, Rotterdam, H. J. Baker & Bro.; 165 dr., Hamburg, Innis, Speiden & Co.; 502 bbl., Hamburg, Hansa Co.; 89 bbl., Hamburg, A. Blank; 151 pkg., Hamburg, Order; e

MYROBALANS — 9,600 pkg., Calcutta, Order.

MENTHOL—10 cs., Kobe, Equitable Trust Co.; 50 cs., Kobe, Order.

NAPHTHALENE—500 bg., Hamburg, W. H. Muller & Co.; 495 bg., Hamburg, Irving Nat'l Bank; 750 bg., London, Irving Nat'l Bank; 566 bg., Hamburg, Irving Nat'l Bank.

OILS—Codliver—400 bbl., Bergen, Scott & Bowne; 50 bbl., Bergen, C. Huisking; 50 bbl., Bergen, A. Stallman & Co.; 155 bbl., Bergen, Order; **China wood**—100 bbl., Hankow, Mitsui & Co.; 15,000 piculs, Hankow, L. C. Gillespie & Sons; **Fusel**— 30 csk., Marseilles, Order; 70 pkg., Hamburg, Order; 23 dr., Darien, L. Naiditch; 18 csk., Hamburg, Guaranty Trust Co.; 10 dr., Malaga, Du Pont de Nemours & Co.; **Linseed**—100 bbl., Rotterdam, Nat'l City Bank; 283 bbl., Rotterdam, Order; 88 bbl., London, International Comp. Co.; **Palm**—320 csk., Marseilles, Order; 202 bbl., Hamburg, African & Eastern Trading Corp.; 200 csk., Koke, Niger Co.; 641 csk., Bevinter, Irving Bank; 430 csk., Opobo, Niger Co.; 354 csk., Abonema, African & Eastern Trading Corp.; 80 csk., Abonema, W. A. Leaman; 800 csk., Abonema, Niger Co.; 570 csk., Port Harcourt, Niger Co.; 72 csk., Lagos, G. B. Ollivant & Co.; 415 csk., Cotonio, J. Holt & Co.; 47 csk., Cotonio, Order; 175 csk., Grandpope, Thornett & Fehr; 392 csk., Liverpool, African & Eastern Trading Corp.; 155 csk., Liverpool, Order; 380 csk., London, African & Eastern Trading Corp.; **Peanut**—400 csk., Rotterdam, H. S. Head; **Perilla**—250 bbl., Koke, Balfour, Williamson & Co.; 150 bbl., Kobe, Bank of N. Y.; 325 bbl., Dairen, Cook & Swan Co.; 106 bbl., Dairen, East Asiatic Co.; **Sardine**—1,900 cs., Kobe, Cook & Swan Co.

SESAME—279 bbl., Rotterdam, Nat'l City Bank; 292 bbl., Rotterdam, Order.

SULPHUR (olive foots)—500 bbl., Naples, Banca Comm. Ital.; 300 bbl., Palermo, Order; 100 bbl., Seville, Chem. Nat'l Bank; 600 bbl., Seville, Bank of the Manhattan Co.; 100 bbl., Seville, Order; 250 bbl., Malaga, Order; 450 bbl., Naples, Banca Comm. Ital.; 300 bbl., Catania, Order.

POTASSIUM SALTS—131 bbl., nitrate, Hamburg, Innis, Speiden & Co.; 10 bbl., prussiate, Hamburg Bank of America; 129 pkg., salts, Hamburg, A. Klipstein & Co.; 227 bbl., nitrate, Hamburg, Order; 10 csk., bisulphite, Hamburg, Order; 70 bbl., carbonate, Hamburg, Order; 596 bbl., chlorate, Hamburg, Order; 39 cs., chloride, Bremen, Pfaltz & Bauer; 1 500 csk., chlorate, Hamburg, Mech. & Metals Nat'l Bank; 54 csk., salts, Hamburg, Kuttroff, Pickhardt & Co.; 55 dr., permanganate, Rotterdam, Order; 644 csk., nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 103 csk., carbonate, Hamburg, Goldschmidt Corp.; 30 bbl., carbonate, Hamburg, J. Munroe & Co.; 702 dr., caustic, Hamburg, A. Klipstein & Co.; 17 csk., potash salts, Hamburgh, Roessler & Hasslacher Chem. Co.; 100 csk., alum, Hamburg, A Klipstein & Co.; 100 dr. permanganate Hamburg, E. M. Sergeant & Co.; 22 csk., carbonate, Hamburg, Order; 2,000 bbl., chlorate, Hango, Amer. Kreuger & Toll Corp.; 33 csk., Hamburg, Am. Ex. Nat'l Bank; 30 dr., permanganate, Antwerp, Ellis, Jackson & Co.; 140 csk., carbonate Hamburg, Peters, White & Co.; 60 dr., caustic, Hamburg, Peters, White & Co.; 1,200 bbl., chlorate, Hamburg, Mech. & Metals Nat'l Bank; 100 dr., permanganate, Hamburg, Order; 20 kegs prussiate, Liverpool, H. J. Baker & Bro.; 22 csk., carbonate, London, Order.

QUEBRACHO—988 bg., Buenos Aires, Columbia Trust Co.; 16,740 bg., Buenos Aires, Tannin Corp.; 2002 bg., Buenos Aires, Equitable Trust Co.

SEEDS — Linseed — 19,316 bg., Buenos Aires, Bank of the Manhattan Co.; 7,450 bg., Buenos Aires, Merchants Nat'l Bank, Boston; 5,940 tons, Rosario, Spencer Kellogg & Sons; 67,806 bg., Santa Fe, Order; 12,255 bg., San Nicolas, Order; 53,595 bg., Santa Fe, L. Dreyfus & Co.; 44,121 bg., Rosario, Order; 48,074 bg., Ibicuy, Order; 5,378 tons, Rosario, Order. **Sesame**—600 bg., Shanghai, Wah Chang Trading Co., 1,200 bg., Shanghai, East Asiatic Co.

SHELLAC—1,800 pkg., Southhampton, Order; 2,291 bg., Southampton, Order; 23 bg. garnet, Hamburg, Order; 150 bg., London, Order, 45 cs. garnet, Hamburg, A. Murphy & Co.; 45 bg., Hamburg, Order; 200 bg., Calcutta, Chase Nat'l Bank; 47 bg., Calcutta, Nat'l City Bank; 100 chests seed, Calcutta, Bank of America; 100 bg. keerie lac, Calcutta, First Nat'l Bank of Boston; 230 bg., Calcutta, Bank of Br. West Africa; 378 bg., Calcutta, First Federal Foreign Banking Corp.; 1,238 pkg., Calcutta, Order.

SAL AMMONIAC—426 bbl., Hamburg, Order; 98 csk., Hamburg, Order; 46 bbl., Hamburg, J. Munroe & Co.

SODIUM SALTS—58 cs. cyanide, Marseilles, Nat'l City Bank; 4,105 bg. synthetic nitrate 375 csk. nitrite, Brevik, Order; 400 csk. hyposulphite, Marseilles, Order; 61 csk. sulphide, E. Suter & Co.; 72 bbl. fluoride, Hamburg, Innis Speeden & Co.; 97 cs. bromide, Hamburg, Farmers Loan & Trust Co.; 63 dr. perborate, Hamburg, Chem. Nat'l Bank; 39 csk. prussiate, Hamburg, Meteor Products Co.; 291 dr. sulphide, Hamburg, Order; 10,808 bg. nitrate, Iquique, Wessel, Duval & Co.; 11,183 bg. nitrate, Iquique, Du Pont de Nemours & Co.; 33,220 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 18,870 bg., Antofagasta, for Norfolk; 30 csk. perborate, Hamburg, Blackburn Trading Co.; 500 sk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 150 csk. perborate, Hamburg, Order; 19 cs. carbonate, T. Nevin; 53,800 bg. nitrate, Tocopilla, W. R. Grace & Co.; 49,926 bg., Iquique, W. R. Grace & Co.; 17 csk. Rotterdam, A. Klipstein & Co.; 9,161 bg. nitrate, Iquique, Baring Bros. & Co.; 26 csk. perborate, Hamburg, Globe Shipping Co.; 27 csk. fluoride, Hamburg, Order; 396 dr. sulphide, Hamburg, Order; 54 bbl. acetate, Antwerp, Roessler & Hasslacker Chem. Co.; 94 bbl. phosphate, Antwerp, A. Klipstein & Co.; 86 dr. sulphide, E. Suter & Co.; 200 bg. sulphide, Hamburg, Equitable Trust Co.; 200 bbl. hyposulphide, Hamburg, Order; 10 csk. prussiate, Liverpool, H. J. Baker & Bros.

STRONTIUM NITRATE—38 csk., Hamburg, Meteor Products Co.; 100 bbl., Hamburg, Hummel & Robinson.

TANNIN—17 csk., Havre, Geigy Co.

TARTAR, CRUDE—100 sk., Marseilles, 200 sk., Marseilles, C. Pfizer & Co.; 100 pkg., Marseilles, Brown Bros. & Co.; 365 bg., Valencia, C. Pfizer & Co.; 277 bg., Alicante, C. Pfizer & Co.; 484 bg., Alicante, Order; 293 bg., Rotterdam, C. Pfizer & Co.; 34 bg., Valparaiso, Order.

TALC—200 bg., Marseilles, Order.

TALLOW—280 csk., Buenos Aires, Bank of the Manhattan Co.; 296 csk., Buenos Aires, Armour & Co.

VERDIGRIS—20 cs., Marseilles, C. Hensking; 20 csk., Marseilles, A. Klipstein.

WAXES — 100 bg. carnauba, Recife, Elbert & Co.; 121 bg. carnauba, Ceara, Strohmeyer & Arpe Co.; 50 bg., Ceara, Lazard Freres; 2 bg., Ceara, Order; 200 cs. vegetable, Kobe, H. R. Lathrop & Co.; 32 bg. bees, London, Order; 50 bg. bees, Valparaiso, Strohmeyer & Arpe Co.; 40 bg. bees, Valparaiso, Order; 294 bg., Antwerp, Elbert & Co.

WOOL GREASE — 90 bbl., Antwerp, Elbert & Co.

ZINC CHLORATE—50 csk., Hamburg, A. Klipstein & Co.

ZINC CHLORIDE—69 csk., Hamburg, Order; 33 csk., Hamburg, Hardy & Ruperti, Inc.

ZINC OXIDE — 200 bbl., Marseilles, Bankers Trust Co.; 500 bbl., Marseilles, Nat'l City Bank.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetic anhydride, 85%, drums	lb.	$0.38 –	....
Acetone, drums	lb.	.22 –	.23
Acid, acetic, 28%, bbl.	100 lb.	3.17½ –	3.92½
Acetic, 56%, bbl.	100 lb.	6.35 –	6.37
Glacial, 99½%, bbl.	100 lb.	12.05 –	12.85
Boric, bbl.	lb.	.11 –	.11½
Citric, kegs	lb.	.49 –	.50
Formic, 85%	lb.	.14½ –	.17
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.12 –	.12½
Lactic, 44%, tech., light, bbl.	lb.	.11½ –	.12
22% tech., light, bbl.	lb.	.05½ –	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks, 100	lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½ –	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.13½ –	.13½
Phosphoric, 50% carboys	lb.	.07½ –	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	10.00
Sulphuric, 60°, drums	ton	12.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	15.50
Sulphuric, 66° drums	ton	19.00 –	20.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp. crys., bbl.	lb.	.34 –	....
Tartaric, imp., powd., bbl.	lb.	.34 –	....
Tartaric, domestic, bbl.	lb.	.35 –	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.27 –	.29
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.75 –	4.95
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 188 proof No. 1, bbl.	gal.	.39 –	.40
Alum, ammonia, lump, bbl.	lb.	.03½ –	.03½
Potash, lump, bbl.	lb.	.03 –	.03½
Chrome, lump, potash, bbl.	lb.	.05½ –	.05½
Aluminum sulphate, com., bags	100 lb.	1.50 –	1.65
Iron free bags	lb.	.02½ –	.02½
Aqua ammonia, 26°, drums	lb.	.06½ –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ –	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	3.50 –	3.75
Arsenic, white, powd., bbl.	lb.	.15½ –	.16
Arsenic, red, powd., kegs	lb.	.14½ –	.15
Barium carbonate, bbl.	ton	78.00 –	80.00
Barium chloride, bbl.	ton	90.00 –	95.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks		.08 –	.08½
Barium sulphate, bbl.	lb.	.04 –	.04½
Blanc fixe, dry, bbl.	lb.	.04½ –	.04½
Blanc fixe, pulp, bbl.	ton	45.00 –	55.00
Bleaching powder, f.o.b. wks., drums	100 lb.	2.15 –	
Spot N. Y. drums	100 lb.	2.60 –	2.70
Borax, bbl.	lb.	.05½ –	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	3.50 –	3.60
Calcium carbide, drums	lb.	.04½ –	.04½
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	lb.	.01½ –	.01½
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07
Camphor, cases	lb.	.89 –	.91
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.10 –	....
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04½
Domestic, heavy, bbl.	lb.	.03½ –	.03½
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, cylinders	lb.	.06 –	.06½
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	16.50 –	20.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Copper sulphate, crys., bbl., 100	lb.	6.25 –	6.50
Cream of tartar, bbl.	lb.	.25½ –	.26½
Epsom salt, dom., tech., bbl.	100 lb.	2.00 –	2.25
Epsom salt, imp., tech., bags	100 lb.	1.10 –	1.25
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.50 –	2.75
Ether, U.S.P., drums	lb.	.13 –	.15
Ethyl acetate, com., 85%, drums	gal.	.80 –	.85
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00
Formaldehyde, 40%, bbl.	lb.	.14½ –	.16
Fullers earth, f.o.b. mines	net ton	16.00 –	17.00
Fullers earth—imp., powd.,	net ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	3.55 –	4.05
Fusel oil, crude, drums	gal.	2.30 –	2.40
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	$1.00 –	$1.25
Glycerine, c.p., drums extra	lb.	.18 –	.18½
Glycerine, dynamite, drums	lb.	.16½ –	....
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½ –	.10
White, basic sulphate, casks	lb.	.09½ –	....
White, in oil, kegs	lb.	.12½ –	.14
Red, dry, casks	lb.	.11½ –	.12
Red, in oil, kegs	lb.	.13½ –	.15
Lead acetate, white crys., bbl.	lb.	.13½ –	.14
Brown, broken, casks	lb.	.12½ –	....
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½ –	.11
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½ –	.07½
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	1.21 –	1.23
Methanol, 97%, bbl.	gal.	1.23 –	1.25
Nickel salt, double, bbl.	lb.	.10½ –	....
Nickel salts, single, bbl.	lb.	.11½ –	....
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.35 –	.40
Phosphorus, yellow, cases	lb.	.30 –	.35
Potassium bichromate, casks	lb.	.10½ –	.10¾
Potassium bromide, gran., bbl.	lb.	.16½ –	.23
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ –	.07
Potassium chlorate, powd.	lb.	.07½ –	.08
Potassium cyanide, drums	lb.	.45 –	.50
Potassium, first sorts, cask	lb.	.09	.09½
Potassium hydroxide (caustic potash) drums	100 lb.	8.25 –	8.50
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½ –	.07½
Potassium permanganate, drums	lb.	.25 –	.25½
Potassium prussiate, red, casks	lb.	.80 –	.85
Potassium prussiate, yellow, casks	lb.	.37½ –	.38
Salammoniac, white, gran., casks, imported	lb.	.07 –	.07½
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20 –	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.60 –	1.67
Soda ash, light, basis, 48%, bags, contract, f.o.b. wks.	100 lb.	1.20 –	1.30
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.75 –	1.80
Soda ash, dense, bags, contract, basis 48%	100 lb.	1.17½ –	1.20
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums, f.a.s.	100 lb.	3.45 –	3.70
Soda, caustic, 76%, solid, drums, contract	100 lb.	3.35	3.40
Soda, caustic, basis 60% wks., contract	100 lb.	2.50 –	2.60
Soda, caustic, ground and flake, contracts	100 lb.	3.80 –	3.90
Soda, caustic, ground and flake, resale	100 lb.	4.00 –	4.15
Sodium acetate, works, bags	lb.	.06 –	.06½
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.07½ –	.08
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ –	.04½
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.20 –	.23
Sodium fluoride, bbl.	lb.	$0.09½ –	$0.10
Sodium hyposulphite, bbl.	lb.	.02½ –	.03
Sodium nitrite, casks	lb.	.08½ –	.09
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.04
Sodium prussiate, yel. drums	lb.	.18 –	.18
Sodium silicate (40°, drums)	100 lb.	.80 –	1.25
Sodium silicate (60°, drums)	100 lb.	2.00 –	2.25
Sodium sulphide, fused, 60-62% drums	lb.	.04½ –	.04½
Sodium sulphite, crys., bbl.	lb.	.03½ –	.03½
Strontium nitrate, powd., bbl.	lb.	.09½ –	.10
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bbl.	100 lb.	2.35 –	3.15
Sulphur, roll, bbl.	100 lb.	2.00 –	2.50
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.13½ –	.14
Tin oxide, bbl.	lb.	.52 –	.54
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06 –	.07
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½ –	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½ –	....
French, green seal, bags	lb.	.10½ –	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	2.75 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.70 –	$0.80
Alpha-naphthol, ref., bbl.	lb.	.85 –	.95
Alpha-naphthylamine, bbl.	lb.	.36 –	.38
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.24 –	.25
Anthracene, 80%, drums	lb.	.75 –	1.00
Anthracene, 80%, imp., drums, duty paid	lb.	.70 –	.75
Anthraquinone, 25% paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.40 –	1.45
Benzene, pure, water-white, tanks and drums	gal.	.32 –	.35
Benzene, 90%, tanks & drums	gal.	.27 –	.30
Benzene, 90%, drums, resale	gal.	.30 –	.33
Benzidine base, bbl.	lb.	.85 –	.90
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.72 –	.75
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.25 –	.27
Benzyl chloride, tech., drums	lb.	.20 –	.23
Beta-naphthol, subl., bbl.	lb.	.55 –	.60
Beta-naphthol, tech., bbl.	lb.	.23 –	.23½
Beta-naphthylamine, tech.	lb.	.80 –	.90
Carbasol, bbl.	lb.	.75 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.24 –	.26
Cresylic acid, 97%, resale, drums	gal.	1.40 –	1.50
95-97%, drums, resale	gal.	1.30 –	1.30
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.42 –	.43
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitroclorbenzene, bbl.	lb.	.22 –	.23
Dinitronaphthalene, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluene, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.80 –	.85
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, crushed, bbl.	lb.	.08 –	.09
Naphthalene, flake, bbl.	lb.	.09½ –	.10
Naphthalene, balls, bbl.	lb.	.10½ –	.11
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.15 –	.17
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.15
Para-amidophenol, base, kegs	lb.	1.20 –	1.30
Para-amidophenol, HCl, kegs	lb.	1.25 –	1.35
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitraniline, bbl.	lb.	.74 –	.75
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl.	lb.	.95 –	.98
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., drums	lb.	.50 –	.55
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	2.50 –	2.75

Resorcinol, tech., kegs	lb.	$1.40 –	$1.50
Resorcinol, pure, kegs	lb.	2.00 –	2.10
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.47 –	.48
Salicylic acid, U.S.P., bbl	lb.	.50 –	.52
Solvent naphtha, water-white, drums	gal.	.37 –	.40
Crude, drums	gal.	.22 –	.24
Sulfanilic acid, crude, bbl	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Toluidine, kegs	lb.	1.20 –	1.30
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.35
Toluene, drums	gal.	.35 –	.40
Xylidines drums	lb.	.45 –	.47
Xylene, pure, drums	gal.	.45 –	.50
Xylene, com., drums	gal.	.35 –	.37
Xylene, com., tanks	gal.	.30 –	.....

Naval Stores

Rosin B-D, bbl. 280 lb.		$6.20 –	.....
Rosin E-I, bbl. 280 lb.		6.30 –	.....
Rosin K-N, bbl. 280 lb.		6.35 –	6.75
Rosin W.G.-W.W., bbl. 280 lb.		7.00 –	8.00
Wood rosin, bbl. 280 lb.		6.25 –	.....
Turpentine, spirits of, bbl	gal.	1.58 –	1.60
Wood, steam dist., bbl	gal.	1.42 –	1.43
Wood, dest. dist., bbl	gal.	1.15 –	1.17
Pine tar pitch, bbl. 200 lb.		..... –	6.00
Tar, kiln burned, bbl. 500 lb.		..... –	12.00
Retort tar, bbl. 500 lb.		..... –	11.00
Rosin oil, first run, bbl	gal.	.45 –	.....
Rosin oil, second run, bbl	gal.	.48 –	.....
Rosin oil, third run, bbl	gal.	.52 –	.....
Pine oil, steam dist	gal.	.80 –	.....
Pine oil, pure, dest. dist	gal.	.75 –	.....
Pine tar oil, ref	gal.	.48 –	.....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla	gal.	.31 –	.31½
Pine tar oil, double ref., bbl	gal.	..... –	.75
Pine tar, ref., thin, bbl	gal.	..... –	.25
Pinewood creosote, ref., bbl.	gal.	..... –	.52

Animal Oils and Fats

Degras, bbl	lb.	$0.03½ –	$0.04½
Grease, yellow, bbl	lb.	.08½ –	.08¾
Lard oil, Extra No. 1, bbl	gal.	.92 –	.94
Neatsfootoil, 20 deg. bbl	gal.	1.28 –	1.32
No. 1, bbl	gal.	.92 –	.94
Oleo Stearine	lb.	.11 –	.....
Red oil, distilled, d.p. bbl	lb.	11½ –	.....
Saponified, bbl	lb.	11½ –	.....
Tallow, extra, loose	lb.	.09 –	.....
Tallow oil, acidless, bbl	gal.	.96 –	.98

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.14 –	.....
Castor oil, No. 1, bbl	lb.	.14½ –	.....
Chinawood oil, bbl	lb.	.35 –	.37
Coconut oil, Ceylon, bbl	lb.	.10½ –	.10¾
Ceylon, tanks, N.Y.	lb.	.09½ –	.09¾
Coconut oil, Cochin, bbl	lb.	.10½ –	.....
Corn oil, crude, bbl	lb.	.12½ –	.....
Crude, tanks, (f.o.b. mill)	lb.	.10½ –	.10¾
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.10½ –	.10¾
Summer yellow, bbl	lb.	.12½ –	.13
Winter yellow, bbl	lb.	.13½ –	.13¾
Linseed oil, raw, car lots, bbl.	gal.	1.17 –	.....
Raw, tank cars (dom.)	gal.	1.12 –	.....
Boiled, cars, bbl. (dom.)	gal.	1.19 –	.....
Olive oil, denatured, bbl	gal.	1.15 –	.....
Sulphur, (foots) bbl	lb.	.09½ –	.09¾
Palm, Lagos, casks	lb.	.08½ –	.08¾
Niger, casks	lb.	.08½ –	.08¾
Palm kernel, bbl	lb.	.09½ –	.09¾
Peanut oil, crude, tanks (mill)	lb.	.13½ –	.14
Peanut oil, refined, bbl	lb.	.17 –	.....
Perilla, bbl	lb.	.16½ –	.16¾
Rapeseed oil, refined, bbl	gal.	.85 –	.86
Rapeseed oil, blown, bbl	gal.	.90 –	.91
Sesame, bbl	lb.	.13½ –	.13¾
Soya bean (Manchurian), bbl.	lb.	.12½ –	.....
Tank, f.o.b. Pacific coast	lb.	.10½ –	.10¾
Tank, (f.o.b. N.Y.)	lb.	.10½ –	.11

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.70 –	$0.72
Menhaden, light pressed, bbl.	gal.	.76 –	.....
White bleached, bbl	gal.	.78 –	.....
Blown, bbl	gal.	.82 –	.....
Crude, tanks (f.o.b. factory)	gal.	.55 –	.....
Whale No. 1 crude, tanks, coast	lb.	.06½ –	.....
Winter, natural, bbl	gal.	.76 –	.78
Winter, bleached, bbl	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$36.00 –	.....
Copra, sun dried, bags, (c.i.f.)	lb.	.06½ –	$.06¾
Sun dried Pacific coast	lb.	.05¾ –	.05¾
Cottonseed meal, f.o.b. mills	ton	40.00 –	41.00
Linseed cake, bags	ton	36.00 –	.....
Linseed meal, bags	ton	38.00 –	.....

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.72 –	.75
Cochineal, bags	lb.	.35 –	.36
Cutch, Borneo, bales	lb.	.04½ –	.05
Cutch, Rangoon, bales	lb.	.12 –	.12½
Dextrine, corn, bags 100 lb.		3.39 –	.....
Dextrine, gum, bags 100 lb.		3.74 –	.....
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	28.00 –	30.00
Logwood, chips, bags	lb.	.02½ –	.03¼
Sumac, leaves, Sicily, bags	ton	65.00 –	.....
Sumac, ground, bags	ton	$55.00 –	$60.00
Sumac, domestic, bags	ton	35.00 –	.....
Tapioca flour, bags	lb.	.03½ –	.05

Extracts

Archil, conc., bbl	lb.	$0.17 –	$0.18
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl	lb.	.04 –	.05
Fustic, crystals, bbl	lb.	.20 –	.22
Fustic, liquid, 42°, bbl	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08 –	.09
Hematine crys., bbl	lb.	.14 –	.18
Hemlock, 25% tannin, bbl	lb.	.04 –	.05
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl	lb.	.14 –	.17
Logwood, crys., bbl	lb.	.19 –	.20
Logwood, liq., 51°, bbl	lb.	.09 –	.10
Quebracho, solid, 65% tannin, bbl	lb.	.04½ –	.05
Sumac, dom., 51°, bbl	lb.	.06½ –	.07

Dry Colors

Blacks–Carbongas, bags, f.o.b. works	lb.	$0.16 –	$0.18
Lampblack, bbl	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl	lb.	.55 –	.60
Prussian, bbl	lb.	.55 –	.60
Ultramarine, bbl	lb.	.08 –	.35
Browns, Sienna, Ital., bbl	lb.	.06 –	.14
Sienna, Domestic, bbl	lb.	.03½ –	.04
Umber, Turkey, bbl	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl	lb.	.32 –	.34
Chrome, commercial, bbl	lb.	.12 –	.12½
Paris, bulk	lb.	.30 –	.35
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl	lb.	1.30 –	1.32
Yellow, Chrome, C.P. bbls	lb.	.20 –	.21
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl	lb.	$0.28 –	$0.30
Beeswax, crude, bags	lb.	.21 –	.25
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.24 –	.25
Carnauba, No. 1, bags	lb.	.39 –	.40
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.19½ –	.....
Japan, cases	lb.	.14½ –	.15
Montan, crude, bags	lb.	.04½ –	.04½
Paraffine, crude, match, 105-110 m.p.	lb.	.04½ –	.04½
Crude, scale 124-126 m.p., bags	lb.	.03 –	.03¼
Ref., 118-120 m.p., bags	lb.	.03¼ –	.....
Ref., 125 m.p., bags	lb.	.03¼ –	.....
Ref, 128-130 m.p., bags	lb.	.04 –	.04¼
Ref., 133-135 m.p., bags	lb.	.04½ –	.04¾
Ref., 135-137 m.p., bags	lb.	.05 –	.05½
Stearic acid, agle pressed, bags	lb.	.14 –	.....
Double pressed, bags	lb.	.14½ –	.....
Triple pressed, bags	lb.	.16 –	.....

Fertilizers

Ammonium sulphate, bulk, f.o.b. works 100 lb.		$3.25 –	$3.30
F.a.s. double bags 100 lb.		4.00 –	.....
Blood, dried, bulk	unit	4.50 –	.....
Bone, raw, 3 and 50, ground	ton	27.00 –	30.00
Fish scrap, dom., dried, wks	unit	3.75 –	10.00
Nitrate of soda, bags 100 lb.		2.65 –	2.67½
Tankage, high grade, f.o.b. Chicago	unit	4.25 –	4.50
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 –	$4.50
Tennessee, 78-80%	ton	8.00 –	8.25
Potassium muriate, 80%, bags	ton	35.00 –	36.00
Potassium sulphate, bags basis 90%	ton	45.67 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.30 –	.....
Upriver coarse	lb.	.27 –	.....
Upriver caucho ball	lb.	.29 –	.....
Plantation—First latex crepe	lb.	.33½ –	.....
Ribbed smoked sheets	lb.	.33½ –	.....
Brown crepe, thin, clean	lb.	.31½ –	.32
Amber crepe No. 1	lb.	.32½ –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.18½ –	$0.19
East Indian, bold, bags	lb.	.22 –	.23
Manila, pale, bags	lb.	.21 –	.22
Pontinak, No. 1 bags	lb.	.21 –	.22
Damar, Batavia, cases	lb.	.30½ –	.31
Singapore, No. 1, cases	lb.	.34 –	.35
Kauri, No. 1, cases	lb.	.62 –	.66
Ordinary chips, cases	lb.	.18 –	.20
Manjak, Barbados, bags	lb.	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.78 –	.....
Orange superfine, bags	lb.	.80 –	.....
A. C. garnet, bags	lb.	.77 –	.....
Bleached, bonedry	lb.	89 –	.....
Bleached, fresh	lb.	77 –	.....
T. N., bags	lb.	.76 –	.77

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$450.00 –	$550.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$60.00 –	$80.00
Asbestos, cement, f.o.b., Quebec	sh. ton	15.00 –	17.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	28.00 –	.....
Barytes, crude f.o.b. mines, bulk	net ton	10.00 –	11.00
Casein, bbl., tech	lb.	.23 –	.25
China clay (kaolin) crude, f.o.b. Ga	net ton	7.00 –	9.00
Washed, f.o.b. Ga	net ton	8.00 –	9.00
Powd., f.o.b. Ga	net ton	13.00 –	20.00
Crude f.o.b. Va	net ton	8.00 –	12.00
Ground, f.o.b. Va	net ton	13.00 –	20.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	6.00 –	7.00
No. 2 pottery	long ton	5.00 –	5.50
No. 1 soap	long ton	7.00 –	7.50
No. 1 Canadian, f.o.b. mill	long ton	25.00 –	27.00
Graphite, Ceylon, lump, first quality, bbl	lb.	.06 –	.06½
Ceylon, chip, bbl	lb.	.05 –	.05½
High grade amorphous crude	ton	35.00 –	50.00
Gum arabic, amber, sorts, bags	lb.	.15 –	.16
Gum tragacanth, sorts, bags	lb.	.50 –	.60
No. 1, bags	lb.	1.75 –	1.80
Kieselguhr, f.o.b. Cal	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl	lb.	.05 –	.05½
Dom., ground, bbl	lb.	.06 –	.07
Silica, glass sand, f.o.b. Ind	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind	ton	2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill	ton	17.00 –	17.50
Silica, bldg. sand, f.o.b. Pa	ton	2.00 –	2.75
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 –	9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	16.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.75 –	.....
Corning	bbl.	2.15 –	.....
Cabell	bbl.	2.41 –	.....
Somerset	bbl.	2.20 –	.....
Illinois	bbl.	2.37 –	.....
Indiana	bbl.	2.38 –	.....
Kansas and Oklahoma, 28 deg.	bbl.	1.50 –	$1.60
California, 35 deg. and up	bbl.	1.04 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.24½ –	.....
Naphtha, V. M. & P. devd, steel bbls	gal	.23½ –	.....
Kerosene, ref. tank wagon	gal.	.15 –	.....
Bulk, W. W. export	gal.	.08 –	.....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.27 –	.30
Bloomless, 30@31 grav	gal.	.20 –	.22
Paraffin, pale	gal.	.24 –	.25
Spindle, 200, pale	gal.	.25 –	.26
Petrolatum, amber, bbls	lb.	.05 –	.05½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton		$45–50
Chrome brick, f.o.b. Eastern shipping points	ton		50–52
Chrome cement, 40-50% Cr_2O_3	ton		23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton		23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks	1,000		40–46
2nd. quality, 9-in. shapes, f.o.b. wks	1,000		36–41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton		65–68
9-in. arches, wedges and keys	ton		80–85
Scraps and splits	ton		85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000		48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000		48–50
F.o.b. Mt. Union, Pa	1,000		42–44
Silicon carbide refract. brick, 9-in.	1,000		1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.11½	.11¾
4-6% C	lb.	.12 –	.13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	115.00 –	120.00
Spiegeleisen, 19-21% Mn	gr. ton	35.00 –	37.00
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	1.90 –	2.15
Ferrosilicon, 10-15%	gr. ton	38.00 –	40.00
50%	gr. ton	86.00 –	89.00
75%	gr. ton	150.00 –	160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.85 –	$0 90
Ferro-uranium, 35-50% of U. per lb. of U	lb.	6.00 –	
Ferrovanadium, 30-40%, per lb. of V	lb.	3.75 –	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$6.50 –	$8 75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	23 00
C.i.f. Atlantic seaboard	ton	20.50 –	26 00
Coke, fdry., f.o.b. ovens	ton	8.25 –	8 50
Coke, furnace, f.o.b. ovens	ton	7.00 –	7.25
Fluorspar, gravel, f.o.b. mines' Illinois	ton	21.50 –	
Ilmenite, 52% TiO_2	lb.	.01½ –	.01½
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.33 –	
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 –	.70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	11½ –	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	11½ –	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12	
Rutile, 95% TiO_2	lb.	.12 –	
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 –	8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 –	8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 –	2.50
Vanadium pentoxide, 99%	lb.	12.00 –	14 00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	
Zircon, washed, iron free, f.o.b. Pablo, Fla.	lb.	.04½ –	.13

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	16½-16¾
Aluminum, 98 to 99%	23–24
Antimony, wholesale, Chinese and Japanese	9– 9½
Nickel, virgin metal	25–27
Nickel, ingot and shot	29.00
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	47.625
Lead, New York, spot	8.25
Lead, E. St. Louis, spot	8.20
Zinc, spot, New York	7.85
Zinc, spot, E. St. Louis	7.50

Other Metals

Silver (commercial)	oz.	$0.65½
Cadmium	lb.	1.10
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	2.65@2.85
Magnesium, ingots, 99%	lb.	1.25–
Platinum	oz.	115.00
Iridium	oz.	260.00@275.00
Palladium	oz.	79.00
Mercury	75 lb.	70.00–

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20.75
Copper bottoms	30.75
Copper rods	20 50
High brass wire	19 50
High brass rods	17 00
Low brass wire	21 10
Low brass rods	22 00
Brazed brass tubing	24 25
Brazed bronze tubing	29.00
Seamless copper tubing	25 25
Seamless high brass tubing	23.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	11.30@11.50
Copper, heavy and wire	11 25@11.50
Copper, light and bottoms	9.25@ 9.50
Lead, heavy	5.75@ 6.00
Lead, tea	3.50@ 3.75
Brass, heavy	6.25@ 6.40
Brass, light	5.35@ 5.75
No. 1 yellow brass turnings	6.30@ 6.50
Zinc	3.50@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3 29	$3.14
Soft steel bars	3.19	3.04
Soft steel bar shapes	3.19	3.04
Soft steel bands	3.29	3 19
Plates, ¼ to 1 in. thick	3.29	3.14

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arizona

MESA—The Attaway-Phelps Cotton Co. has perfected plans for the erection of a new cottonseed oil mill on local site, estimated to cost about $50,000. Four primary presses and auxiliary machinery will be installed. E. G. Attaway is president.

California

SAN MATEO—The McClenahan Products Co., 601 Howard St., San Francisco, manufacturer of brick, sewer pipe and other burned clay products, has plans under consideration for the erection of a new plant on site selected at East San Mateo. It is estimated to cost close to $40,000, with machinery.

VINDALE STATION—The Rio Grande Oil Co., operating in the Montebello field, near Santa Fe Springs, has acquired a local site, comprising about 100 acres, for the construction of a new oil refining plant, estimated to cost in excess of $100,000, with machinery. The company is operating other refineries in this district. L. E. Lockhart is president.

LOS ANGELES—The Pacific Coast Borax Co., Kohl Bldg., San Francisco, will commence the immediate erection of the first unit of its proposed new plant in the harbor district, to be equipped for general reduction and refining service. It will be 3-story, with foundations to provide for two additional floors at a later date, estimated to cost approximately $500,000, with machinery. Albert C. Martin, Higgins Bldg., Los Angeles, is architect.

OAKLAND—The California Salt Co., Mills Bldg., San Francisco, will enlarge its plant at Alvarado, near Oakland, in connection with the rebuilding of the portion of the works destroyed by fire in January. Plans are being completed and operations will soon be commenced. The cost is estimated at $300,000, with machinery.

Connecticut

SOUTH COVENTRY—The Willimantic River Paper Co. will soon commence the erection of an addition to its plant, comprising the former mill of the South Coventry Paper Co., and has work in progress on alterations and improvements for considerable increase in capacity. New paper-making machinery and power equipment will be installed. Charles E. Clute is president.

THAMESVILLE—The Uncas Paperboard Co. has completed plans for enlargements in its local mill to increase the capacity from 100 to 200 tons a day. Considerable new machinery will be installed. James E. Smith is president.

Delaware

NEW CASTLE—The Wilmington Fibre Specialty Co. has commenced preliminary work for the erection of 3 new additions to its plant, consisting of a 1-story structure, 86x170 ft., for enlargements in the sheet-making department; 3-story, 64x108 ft., for general manufacture; and 1-story, 30x100 ft. New machinery will be installed, including fiber-making equipment, rolls, hydraulic presses and power apparatus. The expansion is estimated to cost in excess of $250,000. The Austin Co., Bulletin Bldg., Philadelphia, Pa., is the general contractor.

Georgia

SUMMERVILLE—The plant of the Standard Chemical Co., devoted to the manufacture of fertilizers, has been acquired by C. F. Hoffman, Gadsden, Ala., and associates. The new owners plan for extensions and improvements, and will place the works in service at an early date.

ATLANTA—The Atlanta Glass Mfg. Co. is taking bids for the erection of two new plant units on site recently acquired, and purposes to commence work at an early date. The structures will be equipped for the production of glass bottles and containers.

Illinois

URBANA—The Clifford-Jacobs Forging Co. has tentative plans under consideration for the rebuilding of the portion of its foundry, destroyed by fire, March 27, with loss estimated at $75,000, including equipment.

Indiana

NEW PALESTINE—The Indianapolis Steel Products Co. has work under way on a new 1-story plant, 100x200 ft., on local 14-acre site, lately acquired, to be equipped for the manufacture of small steel specialties. Initial employment will be given to about 100 men, and this number considerably increased in the near future. W. M. Lewis and Walter Bledsoe head the company.

INDIANAPOLIS—The Jones X-Plo Mfg. Co. has arranged for the operation of a plant at 341 West 26th St., for the manufacture of chemicals and chemical byproducts.

UPLAND—Fire, April 2, destroyed a portion of the plant of the Upland Flint Bottle Co., including blowing department, with loss estimated at $100,000, including equipment. It is planned to rebuild.

Kansas

WICHITA—The Derby Oil & Refining Corp has commenced enlargements in its local oil refinery to increase the capacity from 4 000 to 5,000 bbl. per day. Other extensions and improvements will be made in the plants in this section. A preferred stock issue of $2,325.000 is being sold, to be used, in part, for the expansion. A. L. Derby heads the company.

ANTHONY—Fire, March 29, destroyed a large section of the local plant of the Anthony Salt Works, Inc., with loss approximating $250,000, with buildings, machinery and stock.

Louisiana

MONROE—The Zeigin-Clarke Oil & Gas Co., recently organized with a capital of $150,000, has plans in progress for the erection of a new gasoline-refining plant, estimated to cost approximately $75,000, with machinery. G. W. Zeigin and W. B. Clarke head the company. Henry Walton is engineer in charge.

MERREAUX—The Sinclair Refining Co. has tentative plans under consideration for the rebuilding of the portion of its oil-refining plant at Merreaux, near New Orleans, destroyed by fire March 28, with loss reported in excess of $750,000, including equipment. Headquarters of the company are at 45 Nassau St., New York.

Maine

LINCOLN—The Lincoln Eastern Pulp Mill is planning for the rebuilding of the portion of its plant destroyed by fire March 22, with loss reported at $23,000.

Maryland

CRISFIELD—The Crisfield Light & Power Co., recently acquired by new interests headed by Isaac H. Tawes and associates, has plans under consideration for extensions and improvements in the local artificial gas plant, including the installation of additional equipment.

Massachusetts

EAST WALPOLE—Bird & Son, Inc., manufacturer of paper and composition roofing, has commenced excavations for a 1- and 2-story plant addition, 90x540 ft., to cost close to $300,000, with equipment. The general contract was awarded recently to the Central Engineering & Construction Co., Pawtucket, R. I. Monks & Johnson, 99 Chauncey St., Boston, are architects and engineers.

NATICK—The Griess-Pfleger Tanning Co.,

Sycamore St., Cincinnati, O., has acquired the tannery of C. W. Dean & Co., and will occupy the structure at an early date. Improvements and alterations will be made; a large portion of the works will be given over to leather-cutting and similar operations.

Michigan

LUDINGTON—The Morton Salt Co. is planning for the erection of a 1-story addition at its local plant, 120x139 ft., for considerable increase in capacity. New grainer pans and other equipment will be installed.

JACKSON—Plans are being completed for the construction of a new 1-story heat-treating plant, 75x125 ft., at the works of the American Gear & Mfg. Co., a subsidiary of the Hupp Motor Car Corp., Detroit.

GRAND RAPIDS—The National Brass Co. will commence immediately the erection of a new 1-story addition, 45x230 ft., at Evergreen and Madison Aves., estimated to cost $25,000, exclusive of equipment.

Missouri

JOPLIN—The Mogul Mining Co., Miami, Mo., has plans in progress for the erection of a new concentrating plant, with capacity of about 200 tons per day. A. E. Dunlap is general manager.

MOUND CITY—The Mound City Roofing Tile Co. is planning for the rebuilding of the portion of its plant on Morganford Ave., recently destroyed by fire with loss of about $25 000.

New Jersey

TRENTON—The New Jersey Porcelain Co. has filed plans for the erection of a new plant on the block bounded by Plum and Strawberry Sts., and Pennsylvania and New York Aves., estimated to cost $60,000. A list of equipment to be installed will be prepared at an early date. Fowler, Seaman & Co., Broad St. Bank Bldg., are architects.

PAULSBORO—The Vacuum Oil Co., 61 Broadway, New York, will commence the erection of a new oil storage and distributing plant here, consisting of a 3-story structure, 100x120 ft., and 2-story building, 60x60 ft. A general contract for the work has been let to the Turner Construction Co., 242 Madison Ave., New York.

MILFORD—The Warren Mfg. Co., specializing in the production of glassine papers, will install additional machinery at its local mill for considerable increase in capacity.

BOUND BROOK—Fire, March 26, destroyed a portion of the foundry of the Bolte Piano Plate Co., Middlesex Borough, near Bound Brook. An official estimate of loss has not been made. It is planned to rebuild. Harry Bolte heads the company.

New York

ROME—The Rome Brass & Copper Co., Bouck St., has plans in progress for the construction of a 1-story and basement addition at its local mill, 50x175 ft., estimated to cost $180,000, including machinery. The company specializes in the manufacture of brass and copper tubing, sheets, etc. Alfred F. Pashley, 431 South Dearborn St., Chicago, Ill., is architect.

BUFFALO—The General Castings Corp., 577-89 Tonawanda St., has tentative plans under consideration for the rebuilding of the portion of its foundry, destroyed by fire March 27, with loss estimated at about $50,000, including equipment.

LITTLE FALLS—The Little Falls Chemical Co., is planning for the erection of a 1-story addition to its plant, 50x100 ft., estimated to cost about $35,000. Louis Vandermeer is treasurer.

ALBANY—Construction will soon be commenced on a new 1-story foundry at the local plant of the Federal Signal Co., to be equipped primarily for the production of steel castings.

TONAWANDA—Officials of the American Radiator Co., Buffalo, have organized the Tonawanda Iron Co., with capital of $1,500,000, to take over the local blast furnaces of the Tonawanda Iron & Steel Co., controlled by the Donner Steel Co., Buffalo. Immediate possession will be taken, and the two stacks remodeled and improved. The plant has a rated capacity of 180,000 tons of pig iron per annum, and will be run on this basis by the new owner, the material to be used at the different radiator works. B. M. Wooley is president, and Wetmore Hodges, secretary and treasurer.

BUFFALO—The Kelly Island Lime & Transport Co., Cleveland, O., will build an addition to its local limekiln plant on the Buffalo River, to cost about $30,000.

North Carolina

RALEIGH—The State Highway Commission has tentative plans for the construction and operation of a cement manufacturing plant, to be used as a source of supply for state road work. Frank Page is chairman.

Ohio

AKRON—The Miller Rubber Co. will commence the immediate erection of a 4-story addition to its tire manufacturing plant, 98x285 ft., estimated to cost about $325,000, with machinery. It will be located in the South Akron section.

HUBBARD—The American Sintering Co., Youngstown, O., has commenced the construction of a new local plant, to be equipped to handle about 1,000 tons of sinter per day.

AKRON—The Anaconda Copper Co. is planning for the immediate construction of a new building at its recently established zinc oxide plant in the North Akron section. The works is giving employment to about 150 men and this force will be increased in the near future.

TOLEDO—The United States Malleable Castings Co. has preliminary plans under consideration for the rebuilding of the portion of its plant, destroyed by fire March 29, with loss estimated at about $500,000, with equipment.

Oklahoma

TULSA—The proposed new local plant of the Union Carbide Co., 30 East 42nd St., New York, on property recently acquired, will be used by its subsidiary organizations, the Prest-O-Lite Co. and the Linde Air Products Co., manufacturers of acetylene products and industrial oxygen specialties, respectively. The works for the last-noted organization will consist of a main 1-story building, 150x200 ft., with smaller structures adjoining.

OKMULGEE—The Waite-Phillips Refining Co. will make enlargements in its local oil refinery, to increase the output from 3,000 to 5,000 bbl. per day. New pressure stills and other equipment will be installed.

HASKELL—The Coleman-Nelson Corp., Tulsa, has acquired the refinery of the Southern Oil Refining Co., at Haskell, with rated capacity of 1,000 bbl. daily. The new owner will take possession immediately and plans for extensions and improvements, including the installation of additional equipment.

Oregon

PORTLAND—The Portland Gas & Coke Co., Gasco Bldg., will commence immediately erection of a new 2-story oil purification plant on St. Helens Rd.

Pennsylvania

LANCASTER—Bids are being taken for the erection of a new 1-story foundry at the plant of the E. T. Fraim Lock Co., Park Ave., 43x170 ft., estimated to cost about $17,000, exclusive of equipment. J. Wilmer Hershey, 1012 East Orange St., Lancaster, is architect.

PITTSBURGH—Fire, March 31, destroyed a portion of the plant of the American Window Glass Co., in the vicinity of New Kensington, near Pittsburgh, with loss estimated at about $200,000, including equipment. It is planned to rebuild. Headquarters of the company are in the Farmers' Bank Bldg.

LANCASTER—The city council has tentative plans under consideration for the construction of a filtration plant at the municipal waterworks.

EDGELY—The Margaree Paper Co., Modena, Pa., will break ground at once for the construction of its proposed new local plant on site recently acquired, comprising two main mills, each 180x200 ft., estimated to cost about $550,000, including machinery. The works will include a power house.

Tennessee

CHATTANOOGA—The Crane Enamelware Co. has tentative plans for the erection of an addition to its local plant, estimated to cost in excess of $150,000, with machinery. It is purposed to develop a large increase in capacity.

Texas

BRECKENRIDGE—The Columbian Carbon Black Products Co. has been granted permission to construct and operate a local plant, on site recently acquired about 5 miles from the city. It will consist of a number of buildings and is estimated to cost approximately $350,000, with machinery. J. W. Hasseli heads the company.

MIRANDO—The Tex-Pata Pipe Line Co. has plans under way for the construction of a new oil refinery on local site, with initial capacity of about 2,000 bbl. per day. Oliver W. Killam is president.

DALLAS—The Centrifugal Concrete Products Co. of America has leased a portion of the factory site of the Liberty Yeast Co. for the establishment of a new plant for the manufacture of special concrete pipe products, made under a centrifugal process.

Washington

CAMAS—The Crown Willamette Paper Co. is arranging for the immediate erection of an addition to its plant, 57x60 ft., to be used as a digester building. R. O. Young is manager at the mill.

Wisconsin

WHITEWATER—Fire, March 30, destroyed a portion of the plant of the Kinzie Rubber Co., occupying a portion of the Kiser Bldg., with loss reported at about $30,000. It is planned to rebuild.

TOMAHAWK—The Tomahawk Kraft Paper Co., recently organized, has taken over the local plant of the Pride Pulp & Paper Co., including mill, water power sites and other property. Plans are under consideration for the construction of a new pulp mill in the vicinity of Grandmother Falls. The Tomahawk plant will be improved and remodeled, and used for the production of kraft papers. Henry M. Thompson and D. C. Everest, the latter of Wausau, Wis., head the company.

Industrial Developments

GLASS—The Inland Glass Co., Chicago, Ill., has increased operations at its new local plant, recently completed, representing an investment of about $500,000, and purposes to develop maximum production at an early date. The mill will be devoted to the manufacture of illuminating glassware. The company was incorporated recently with a capital of $750,000. J. B. Weaver is president.

Decorated glassware plants in all parts of the country are running at maximum capacity and are from 30 to 90 days behind on orders. It is said that the present basis of operations will be maintained throughout the year.

The Ball Brothers Glass Mfg. Co., Muncie, Ind., manufacturer of glass jars, is operating full at its local plant, giving employment to about 1,500 persons. It is expected to run on this schedule for an indefinite period.

Window glass mills in West Virginia are advancing production and additions are being made to the working forces. A number of plants have orders on hand insuring maximum output for a number of months to come.

CERAMIC—The Edwards Brick Co., Columbia, Mo., is arranging for increased production at its plant, and will install considerable new equipment for this purpose. It is planned to develop the 6-kiln plant to maximum, with an output of about 55,000 bricks per kiln, including paving, face and common brick.

The La Junta Clay Products Co., La Junta, Colo., has resumed production at its plant, following the installation of additional equipment, and plans for full operations for an indefinite period. The company specializes in the manufacture of face brick, blocks, drain tile and other burned clay products.

Sanitary ware plants in the Raritan River section of New Jersey are running at full capacity, with full working forces. Orders on hand insure this basis for some months to come.

Brick-manufacturing plants in the Hudson River district, New York, are making ready for early resumption of production, following a shut-down through the winter. It is expected to develop maximum output at the majority of the plants at the earliest possible date.

The Marshfield Brick & Tile Co., Marshfield, Wis., is advancing production at its plant, and plans for improvements to provide for greater capacity. Considerable additional equipment will be installed, both for brick and drain tile manufacture.

PAPER—The Scott Paper Co., Chester, Pa., has completed the installation of additional equipment at its local plant and will main-

tain capacity operations for some time to come. A full working force is employed. Heavy incoming orders are reported

The Backus-Brooks Co., Kenora, Ont., has commenced operations at its new pulp mill and will place other departments of the plant in service as soon as completed. The plant is expected to develop a total capacity of 80 tons of pulp daily.

The Lincoln Paper Co., Elkhart, Ind., is maintaining capacity production at its local plant, giving employment to a full working force. The mill will be continued on this basis for an indefinite period.

The Spruce Falls Co., Ltd., Kapuskasing, Ont., is running at close to normal at its local sulphite plant, averaging about 90 tons per day. The company has plans under consideration for the establishment of a paper mill in the near future.

MISCELLANEOUS—E. I. du Pont de Nemours & Co., Wilmington, Del., have advanced the wages of employees at their explosive and dye works at Carneys Point, Gibbstown and Deepwater, N. J., 10 per cent, or an hourly wage increase of about 6 cents per hour. Approximately 2,000 persons are affected.

The Oklahoma Production & Refining Corp., Muskogee, Okla., has closed its local refining plant as a result of the scarcity of crude oil. It is expected to resume at an early date.

The Vacuum Oil Co., New York, has increased the wages of employees at its Paulsboro, N. J., works 5 cents an hour, effective April 4.

The Carnegie Steel Co., has resumed operations at the first unit of its coke plant at Farrell, Pa., giving work to about 500 men. The plant has been inactive for 24 months past. Other units will be started up until the entire 182 ovens are charged. The benzol plant has also been placed on the active list.

The American Vulcanized Fibre Co., Wilmington, Del., is running at full capacity at its mill at Newark, Del., giving employment to an increased working force.

New Companies

THE ROLLSTONE PAPER CO., Fitchburg, Mass., has been incorporated with a capital of $300,000, to manufacture paper products. Louis T. Stevenson is president, and Henry M. Wheelwright, Newton, Mass., treasurer. The last noted represents the company.

THE RABON PRODUCTS CORP., New York, care of S. T. Stern, 41 Park Row, representative, has been incorporated with a capital of $100,000, to manufacture chemicals and affiliated products. The incorporators are H. Meier, L. Javitz and L. Baker.

CHARLES E. SALMON, INC., Detroit, Mich., has been incorporated with a capital of $25,000, to manufacture inks and kindred products. The incorporators are William H. Wendell, G. W. and Charles E. Salmon, 2501 Gladstone Ave., Detroit. The last noted represents the company.

THE FLORIDA CHINA CLAY CO., Leesburg, Fla., has been incorporated with a capital of $100,000, to operate clay properties and clay refining plants. R. L. Fox is president, and R. B. Bourlar, secretary-treasurer, both of Leesburg.

THE NEW PRESSMAN TIRE & RUBBER CO., Newark, N. J., has been incorporated with a capital of $2,000,000, to manufacture tires and other rubber products. The incorporators are Herman Pressman, Herbert G. Tully and Joseph E. Monteith, 776 Broad St., Newark. The last noted represents the company.

THE RADEX LABORATORIES, INC., care of the Corporation Service Co., Equitable Bldg., Wilmington, Del., representative, has been incorporated under Delaware laws with capital of $100,000, to manufacture chemical products.

THE GILMOUR CHEMICAL CO., Waterbury, Conn., has been incorporated with a capital of $50,000, to manufacture chemical compounds, paint and varnish removers and kindred specialties. The incorporators are A. L. and John Gilmour, 21 Newell Place, Waterbury.

THE NEW JERSEY WAXED PAPER CO., Passaic, N. J., has been incorporated with a capital of $50,000, to manufacture paper products. The incorporators are Walter M. and E. M. Crowell, and Benjamin H. Ballard, 36 Vineyard Place, Passaic. The last noted represents the company.

THE MARKER CHEMICAL CO., Fairmont, W. Va., has been incorporated with a capital of $1,000,000, to manufacture chemicals, fertilizers, etc. The incorporators are R. L. Long and S. S. Burke, Fairmont; and Earl Van Horn, Clarksburg, W. Va.

THE AMALGAMATED LEAD-ZINC SMELTERS CORP., care of the Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del., representative, has been incorporated with a capital of $1,250,000, under Delaware laws, to operate metal smelting and refining plants.

THE CONROE BRICK CO., Conroe, Tex., has been incorporated with a capital of $15,000, to manufacture brick, tile and other burned clay products. The incorporators are B. E. Hinchcliffe, B. J. Lieka and W. M. Merriss, all of Conroe.

THE HOLLAND FOUNDRY CO., Holland, Mich., has been incorporated with a capital of $35,000, to manufacture iron and other metal castings. The incorporators are Theodore Fisher, Chicago, Ill.; Robert H. Carnahan, Jr., and Frank P. Parish, both of Holland. The last noted represents the company.

THE HERMAN CHEMICAL CO. OF MASSACHUSETTS, INC., Boston, has been incorporated with a capital of $10,000, to manufacture chemicals and chemical byproducts. John N. Penick is president; and Walter T. Hannigan, Newton, Mass., treasurer. The last noted represents the company.

THE MARSHALL REFINING CO., Kansas City, Mo., has been incorporated with a capital of $49,000, to manufacture refined petroleum products. The incorporators are W. S. Primley and D. B. Sevastian, both of Kansas City.

THE VAN PELT CONCRETE CO., Milltown, N. J., has been incorporated with a capital of $50,000, to manufacture cement and concrete products. The incorporators are Archie Van Pelt, Conrad W. Kuhlthau and Howard J. Booream, all of Milltown.

THE AGRILIN CHEMICAL CO., New York, care of the Delaware Registration Trust Co., 900 Market St., Wilmington, Del., representative, has been incorporated under Delaware laws with a capital of $550,000, to manufacture chemicals and chemical byproducts. The incorporators are Horace N. Taylor and Louis Pavelek, New York; and William I. Brophy, Rockaway Beach, L. I.

THE W. P. COLLINS OIL CO., 2619 Mary St., Chicago, Ill., has been incorporated with a capital of 900 shares of stock, no par value, to manufacture oils, greases, lubricants, etc. The incorporators are John J., Thomas J., and William J. Collins.

THE BRILLIANT PRINTING INK CO., Philadelphia, Pa., has been incorporated with a capital of $5,000, to manufacture printing and other inks. Ernest Osborne, 5636 Belman Terrace, Philadelphia, is treasurer.

Industrial Notes

C. W. HUNT CO., INC., West New Brighton, N. Y., designer and manufacturer of material-handling equipment, announces that the exclusive license to manufacture and sell the Mitchell electric vibrating screen has been acquired by it. More than 300 of these screens are in operation throughout the world.

THE GIFFORD-WOOD CO., Hudson, N. Y., announces that A. W. Berghoefer has again become associated with it.

THE PURE CARBON CO., Wellsville, N. Y., announces the recent establishment of a northern West Virginia representative in the person of Norman Strugnell of Clarksburg, W. Va.

F. J. RYAN & CO., Philadelphia, announce that J. L. Edwards, for the past 4 years district engineer for the Mahr Mfg. Co., with headquarters at Pittsburgh, Pa., has resigned to take the position of district manager of the Pittsburgh territory of the Ryan Company. Mr. Edwards has been actively participating in the design, installation and sale of steel plant equipment in the Pittsburgh district for nearly 10 years, having been associated with the Westinghouse Electric & Mfg. Co. and the Fairbanks company previous to becoming connected with the Mahr company. The Ryan company's offices will be located in the Oliver Bldg., Pittsburgh, and this office will have supervision over the entire territory of eastern Pennsylvania, certain sections of eastern Ohio and the northern section of West Virginia. Mr. Edwards will be assisted by a corps of trained men.

THE UEHLING INSTRUMENT CO., manufacturer of CO_2 recorders and other power plant gages, has placed Charles J. Schmid in charge of sales in Greater New York and Long Island. Mr. Schmid is well qualified for his duties in this important territory due to his close contact with power plant operators in the interest of fuel economy when formerly in charge of the Boston office. Temporarily Mr. Schmid will make the home office in Paterson, N. J., his headquarters.

Coming Meetings and Events

AMERICAN ASSOCIATION OF CEREAL CHEMISTS will hold its ninth annual convention at Hotel Sherman, Chicago, June 4 to 9.

AMERICAN ASSOCIATION OF ENGINEERS will hold its annual convention in Norfolk, Va., May 7 to 9.

AMERICAN ELECTROCHEMICAL SOCIETY will hold its spring meeting May 3, 4 and 5, 1923, at the Commodore Hotel, New York.

AMERICAN FOUNDRYMEN'S ASSOCIATION will hold a meeting in Cleveland, O., April 30 to May 3.

AMERICAN GAS ASSOCIATION will hold its annual convention the week of Oct. 15 at Atlantic City. An elaborate exhibition of gas-making and gas-utilization equipment is planned.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS will hold its summer meeting June 20-23 at Wilmington, Del.

AMERICAN LEATHER CHEMISTS ASSOCIATION will hold its twentieth annual convention at the Greenbrier, White Sulphur Springs, W. Va., June 7, 8 and 9.

AMERICAN OIL CHEMISTS' SOCIETY will hold its annual meeting at the Eastman Hotel, Hot Springs, Ark., April 30 and May 1.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS will hold its spring meeting May 28 to 31 in Montreal, Canada.

AMERICAN SOCIETY FOR TESTING MATERIALS will hold its twenty-sixth annual meeting at the Chalfonte-Haddon Hall Hotel, Atlantic City, beginning Monday, June 25, 1923, and ending either Friday or Saturday of that week.

AMERICAN WELDING SOCIETY will hold its annual meeting April 25 to 27 at the Engineering Societies Building, New York.

AMERICAN ZINC INSTITUTE, INC., will hold its fifth annual meeting at the Hotel Chase, St. Louis, May 7 and 8.

CANADIAN INSTITUTE OF CHEMISTRY will hold its annual meeting in Toronto, May 29 to 31.

ENGINEERING SECTION of the National Safety Council will hold a mid-year safety conference April 17 in the auditorium of the Western Society of Engineers.

INTERSTATE COTTON SEED CRUSHERS ASSOCIATION will hold its annual convention at Hot Springs, Ark., May 2 to 4.

IRON AND STEEL INSTITUTE (London) will hold its annual meeting May 10 and 11 at the House of the Institution of Civil Engineers, London, S. W. 1.

NATIONAL ASSOCIATION OF MANUFACTURERS OF THE UNITED STATES OF AMERICA will meet in annual conference May 14 to 16, inclusive, at the Waldorf-Astoria, New York City.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH) will be held in New York Sept. 17-22.

NATIONAL FOREIGN TRADE COUNCIL has postponed its annual conference from April 25, 26 and 27, to May 2, 3 and 4. It will be held in New Orleans, La.

NATIONAL LIME ASSOCIATION will hold its fifth annual convention at the Hotel Commodore, New York City, June 13 to 15.

NATIONAL SYMPOSIUM ON COLLOID CHEMISTRY will be held at the University of Wisconsin, June 12 to 15.

SOCIETY OF CHEMICAL INDUSTRY, Canadian Section, will meet in Toronto, May 29 to 31.

NEW JERSEY CHEMICAL SOCIETY holds a meeting at Stetters Restaurant, 842 Broad St., Newark, N. J., the second Monday of every month.

SOCIETY FOR STEEL TREATING — Eastern sectional meeting will be held June 14 and 15, in Bethlehem, Pa.

SOCIETY OF INDUSTRIAL ENGINEERS, with headquarters in Chicago, will hold its spring convention in Cincinnati, April 18, 19 and 20, 1923. The major subject will be "Management Problems of the Smaller Plants."

The following meetings are scheduled to be held in Rumford Hall, Chemists' Club, East 41st St., New York City: May 4—American Chemical Society, regular meeting. May 11—Société de Chimie Industrielle (in charge) American Chemical Society, American Electrochemical Society, Society of Chemical Industry, joint meeting. May 18—Society of Chemical Industry, regular meeting. June 8 — American Chemical Society, regular meeting.